ARMY RESEARCH AND DEVELOPMENT

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Joint Effort Aimed at GEM Development

Theme of the Month

By Major General Marshall Stubbs
Chief Chemical Officer, Department of the Army

Weaknesses in communication of essential scientific information to those who have an established need-to-know have been and will continue to be costly to the Nation—in terms of dollars because of undue duplication of effort, in terms of knowledgeable understanding conducive to effective teamwork and, most importantly, in terms of time from daring new concepts to production of decisively superior weapons systems.

Most human endeavor has been delayed by inherent barriers to understanding. The first barrier is one which exists between every human being and his fellows. No language except perhaps that of mathematics has ever been exact enough to transfer a thought intact from one man to another. This particular roadblock is continuously breached or repaired as man refines his language with knowledge and sound reason or corrupts it by clouding words with incorrect usage.

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Development in the near future of a ground effect machine (GEM) capable of ship-to-shore, over-the-beach, and inland travel was spurred at a recent meeting in Washington, D.C., sponsored jointly by the Army Transportation Corps and the U.S. Marine Corps. Approximately 30 industrial concerns which have been actively interested in the GEM project were represented.

Highlight of the meeting, held at the Office of Naval Research, was a request by the two services for submission by March 15 of proposals for design studies, operations analyses, and component testing of GEMs meeting military requirements. Proposals will be opened for examination at the ONR and the winner or winners will be selected

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Sec. Stahr Slated to Appear Before ASAP at Fort Eustis

Secretary of the Army Elvis J. Stahr, jr., is expected to make his first appearance before the Army Scientific Advisory Panel (ASAP) at a meeting of more than 100 dignitaries at Headquarters of the U.S. Army Transportation Corps, Fort Eustis, Va., April 18–19.

In a letter to Dr. Clifford C. Furnas, Chairman of the ASAP, and Chancellor of the University of Buffalo, N.Y., Secretary Stahr tentatively accepted an invitation to participate in the first full Panel meeting since October. A meeting of the ASAP executive committee was held in January to plan the agenda.

Director Richard S. Morse and Lt Gen Arthur G. Trudeau, Chief of Research and Development, Deputy Chiefs of Staff, and Chiefs of each of the Technical Services or their alternates will participate in the discussions. All ASAP meetings are closed sessions because of the classified nature of business.

Composed of 60 of the Nation's leading scientists, engineers, industrialists, and educators, the ASAP is appointed by the Secretary of the Army to advise him, the Director and the Chief of Research and Development, and the Chief of Staff on all scientific and technological matters of concern to the Army.

Maj Antero Havola, leader of Antarctic Traverse (See page 3)

Army R&D Newsmagazine

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Objectives of this publication are: To improve informal communication among all segments of the Army scientific community and other Government R&D agencies; to further understanding of Army R&D progress, problem areas and program planning; to stimulate more closely integrated and coordinated effort among the widely dispersed and diffused Army R&D activities; to maintain a closer link from top management through all levels to scientists, engineers and technicians at the bench level; to express views of leaders, as pertinent to their responsibilities, and to keep personnel informed on matters germane to their welfare and pride of service.

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Theme of the Month

(Continued from page 1)

A more specific impediment, concerning those of us who are engaged in research and development, can be found in the differences in terms and concepts used by each of the scientific disciplines. This problem increases with the depth and specialization of scientific research. Scientists pass this obstacle by finding common ground for discussion. Each discipline analyzes the discoveries of another in terms of its own knowledge. The success of this process is limited by the difficulty of digesting the immense volume of scientific reports now being produced.

One of the most persistent problems of scientific communication occurs when a scientist, with a superior command of technical terminology, tries to make himself understood to a person with little or no technical background. It seems to me that there are three major causes at the root of this problem.

The first is attitude. Most technicians use terms of scientific shorthand which convey whole volumes of theory and knowledge. These convenient symbols are absolutely necessary if scientific research is to proceed at any measurable pace. They do presuppose an equal degree of learning on the part of the listener, however. Some dedicated scientists become impatient when they must slow down because they cannot use the symbols of their trade. They are often intolerant of those who require explanations of ideas which are fundamental to them.

The second cause is lack of practice. Many times scientists have not attempted to explain a particular point to anyone outside of their own discipline. It may require some trial and error experimentation to develop the proper vocabulary to communicate.

The third cause for the communications barrier is a lack of direct motivation. A scientist can successfully complete a research project without ever having talked to anyone but other scientists. Communication with any other element of society seems unnecessary to the end result of the project. The error in this assumption is the least obvious but can have the greatest impact on the long-range research program.

"Science is underemphasized," or "basic research is not supported," are commonly expressed views. In a democracy, causes are supported because enough people are sympathetic or can see the necessity of them. Support is granted on the basis of understanding. Understanding can only be gained by clear communication of ideas. Lack of communication may throttle a worthwhile research program or render the products of research useless because they are misunderstood and unacceptable.

In developing some solutions to the problems of communication barriers it would seem strange indeed if we, who are involved in scientific research, did not take a rational approach to this challenge. First of all, we should realize that there are some concrete answers within reach. We have already made tremendous strides in communicating our technology. Advances have been made from both directions. The language adjustments which science has made in order to provide information to more people has resulted in an increase in the ability to understand it in more detail.

To speed up the process, we can provide a greater amount of understandable scientific information and expand and improve the media through which it is transmitted. Of course not everyone will progress at the same rate, and frequent repetition of previously exposed material will be necessary.

Eventually, through diligent practice of the art of communication, we should reach a point where almost everyone has the facts he needs for intelligent decision. The roadblocks to understanding between the doctor and the engineer, the lawyer and the chemist, the farmer and the physicist will be broken. Adequate communication within the scientific community, and dissemination of information pertinent to public understanding and support of research and development objectives, will be among the strongest bulwarks of democracy and enduring freedom.

Change of Address Notice for R&D, A&E Career Officers

Officers in the Army Research and Development and Atomic Energy Specialists Programs receive the *Newsmagazine* through special distribution arrangements.

Consequently, whenever their mail address changes, prompt notice should be given to insure continuous delivery. Notices of change should be addressed to: Specialists Branch, OAD (XCP), Deputy Chief of Staff for Personnel, Department of the Army, Washington 25, D.C.

Army-Navy Team Blazes Antarctic "Highway"

Staked out through the treacherously dangerous crevasse fields of a previously untraveled area of Antarctica as an "historic achievement" is an 800-mile "safe highway" for tractor trains, stretching from Byrd Station to the U.S. Amundsen-Scott South Pole Station.

Headed by Maj Antero Havola, U.S. Army Transportation Corps, an 11-man Army-Navy team completed the trail-blazing feat on January 11, 35 days after they started the Byrd-Pole Traverse as part of the Navy's Operation Deep Freeze 1961. Navy Seabees, Army officers, and civilian scientists participated.

Marking the new route across the barren expanse for future travelers are 3,200 12-foot flag-topped bamboo poles set 2 feet deep in ice at precise quarter-mile intervals. Special markers show 5- and 10-mile intervals. To label the trail "safe" is to ignore the fact that crevasses may develop any time and any place along the route. Since snowfall in the area is relatively light, Maj Havola expects the markers to show clearly for many years.

The traverse had a fourfold mission, a primary objective being delivery of two 38-ton D–8 tractors. Too beavy to be transported by air, the tractors ride the snow on 54-inch wide tracks exerting only 4 pounds of pressure per square inch. They will be used in maintaining the snow landing strip, retrieving air-delivered cargo, and constructing station improvements.

From a scientific aspect the important phase of the traverse was the work of Dr. Forrest L. Dowling, University of Wisconsin, and Dr. Harry Rosenthal, Arctic Institute of North America. Under the sponsorship of the National Science Foundation, as part of the United States Antarctic Research Project, they made gravitational and snow studies along the entire route. Their purpose was to determine the profile of the bedrock thousands of feet below and the composition of the overlying ice.

Army Chief Warrant Officer George Fowler was responsible for the fourth phase of the mission. His job called for ground surveys to establish more precisely the geographical location of distinctive terrain features such as mountain peaks, known in the Antarctic as nunataks. Approximate locations had been spotted previously from the air.

Difficulties of staking out the tractor route through the crevasse fields were many. Though the tractor train averaged better than 30 miles on most days, progress was slow on others. At one point Maj Havola was forced to radio Byrd Station and call for aerial reconnaissance. His question: "What is the extent of the crevasse field?"

Twin-engine R–4D Skytrain aircraft of the Navy Air Development Squadron 6 responded, determined a feasible route, radioed instructions to the stalled train, and made a final low altitude pass to drop a map of the proposed route—and, very important, a bag of mail.

As navigator and trail blazer of the expedition, CWO Fowler traveled in a tracked Weasel vehicle approximately 1 mile ahead of the remainder of the train. A second Weasel mounted with crevasse detection equipment rode a sled when not in service. The tractors towed three 20-ton and one 10-ton sleds in addition to two sled-mounted Wannigan huts.

Maj Havola, a 49-year-old resident of Annandale, Va., joined the U.S. Army in 1947, only a year after he emigrated from Finland where he was graduated from the Finnish Military Academy prior to World War II. Explorations in Canada and Greenland prepared him for his role as leader of the Byrd-Pole Traverse.

Upon reaching the U.S. Amundsen-Scott South Pole Station Maj Havola's party was acclaimed by Navy and Army leaders. Rear Adm David M. Tyree, Director of Operation Deep Freeze 1961, stated in a radio message:

"I was pleased and proud to receive the report of your safe arrival at the South Pole. I wish I could have had the privilege of greeting you at the end of your long historic trek in which you blazed a new and important trail across the antarctic ice and snow. This marks, too, the first American party to reach the South Pole by ground travel. You and your men are to be congratulated for the outstanding manner in which you have delivered the train. The skill and efficiency with which you conducted this hazardous operation is a matter of great pride to the entire Task Force. Well done to you and your splendid crew."

Maj Gen F. S. Besson, Chief of the Army Transportation Corps, radioed: "All here applaud your history-making 800-mile overland trip to the South Pole. The many serious hazards encountered and successfully overcome are a tribute to the determination, fortitude, and technical skill of each member of the party. Congratulations to each of you on this truly significant achievement."

Dr. John D. Weisz

Civilian Group Honors Ordnance Psychologist

Recipient of the 1960 Distinguished Service Award of the Harford County, Md., Junior Chamber of Commerce is Dr. John D. Weisz, 35, Director of the Army Ordnance Corps Human Engineering Laboratories, Aberdeen Proving Ground, Md.

Honored recently by the Jaycees at a dinner meeting, Dr. Weisz was selected in recognition of his contributions to the general community welfare, leadership ability, and evidence of personal or business progress.

A resident of Bel Air, Md., Dr. Weisz was graduated from Hot Springs, S. Dak., High School in 1943. Following World War II service as a first sergeant combat infantryman in Europe, he entered the University of Nebraska. There he received his bachelor of arts degree in 1950, his master's degree in 1952 and his degree as a Doctor of Philosophy in 1953—all in psychology. In September 1953, he came to the Proving Ground as a psychologist and in February 1957 was appointed Director of the Human Engineering Laboratories.

Dr. Weisz has served as a member of the Army Human Factors Research Advisory Committee and has achieved prominence in the American Psychological Association. He has also written extensively for scientific journals.

OTAC Conducts Muffler Research

Results of 4½ years of testing by the Ordnance Tank-Automotive Command (OTAC), announced recently, indicate that chrominum-impregnated low-carbon steel most nearly approaches the Army's search for a material that will make mufflers good for the life of a vehicle effecting a substantial saving.

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NIKE ZEUS Entering Advanced Phase

Proved sound in principle by its NIKE predecessors, the NIKE ZEUS antiballistic missile defense system is undergoing critical capability tests aimed at Department of Defense approval for full-scale production.

Department of the Army officials who have followed the progress in development of the forerunners of the NIKE family, the AJAX and the HERCULES, confidently predict the ZEUS system will demostrate its practicability beyond question of doubt.

The position of Army leaders is that the ZEUS defense is capable of protecting the Nation against a sneak attack launched with ICBMs and other ballistic missiles carrying nuclear warheads—that it can be the vital factor in preventing or deciding a nuclear war.

Back of these convictions is the knowledge Army leaders and missile experts have gained in nearly 15 years of research and development. Immediately after World War II, the Army recognized the requirement for missiles that would seek out and destroy other missiles in the vast reaches of space.

Dedicated endeavor by thousands of scientists and engineers engaged in Army-industry teamwork has changed the imaginative science fiction concept of 1946 into the test-proved weapons of the NIKE family. Recently one HERCULES missile destroyed its twin at an altitude of 19 miles while traveling at speed of Mach 7 above the White Sands (N. Mex.) Missile Range. Other tests have demonstrated similarly that ballistic missiles can be intercepted.

Late in January an Army Hawk guided missile "killed" a Corporal ballistic missile at White Sands as they approached each other at several times the speed of sound. The Corporal is the fastest missile the Hawk has intercepted. Previous kills had been recorded against the Army's Little John and Honest John free-flight rockets. These are the surface-to-surface types of ballistic missiles that might be used against ground forces in combat.

Orderly R&D procedures in development of the AJAX and HERCULES established the feasibility of the anti-missile missile concept by 1955. Accordingly, the Army initiated a study conducted by the Bell Telephone Laboratories, where much of the knowledge gained in the R&D process had been accumulated. Based on the study, actual design of the NIKE ZEUS system commenced in early 1957.

Third-generation NIKE ZEUS dwarfs family predecessors, the HERCULES and AJAX, at White Sands.

Like its AJAX and HERCULES forebearers, the ZEUS is designed to provide a 360° defense extending to long ranges and extremely high altitudes, using the proved command guidance system with greatly enhanced capability. Scanning space in all directions, at a rate roughly estimated at 100 million cubic miles a second, the ZEUS acquisition radar has showed it can detect an object the size of a volleyball hurtling through space hundreds of miles away.

Maj. Gen. August Schomburg, Commanding General, Army Ordnance Missile Command, has stated:

"NIKE ZEUS computers can almost instantly determine the track of incoming objects and predict the resulting impact point. Once acquired by the acquisition radar, the target will also come under surveillance of a radar discrimination center. It will supply the precise information required to separate the real warhead and its lethal cargo from decoys and false targets that an attacking ICBM might eject to confuse the defense. . . . At the exact instant dictated by the target intercept computer, the missile is instructed to detonate. It neutralizes the ICBM warhead without damage to the defended area. . . ."

From detection through intercept, the entire operation of the ZEUS system is completely automatic. Newly designed data processors, using tiny switching transistors and a "twister" memory, pass stored information into the system in millionths of a second. The transistors and the twister are examples of many technical advances that have made the ZEUS system feasible.

Detonation instructions are refined to precision that permits only the ZEUS missile for which they are intended to receive them. Thus many ZEUS missiles can be in the air at the same time, each on its way to its own intercept, without danger of being diverted by another's instructions.

Progress in all phases of development of the NIKE ZEUS system has been achieved on schedule; each stage of the missile has been repeatedly and successfully static test fired. A preliminary firing program at the White Sands Missile Range, and an associated engineering effort, improved design of the ZEUS missile to increase its capability.

Powered by a test-proved motor that produces a half million pounds of thrust—the most powerful single solid propellant motor in existence in the free world today—the ZEUS missile can reach extremely high altitudes in seconds. The tactical launcher is an underground silo which has performed well in the test program at White Sands Missile Range.

Final proof-testing of the ZEUS system is or will be in progress at four principal sites. The national defense budget recently submitted to Congress requests $250 million for further testing and development of the system. In addition to White Sands the testing sites are Point Mugu, Calif., Ascension Island in the Atlantic and Kwajalein Island in the Pacific Ocean. Meanwhile, target track and missile track radars are being tested at the Bell Telephone Laboratories R&D Center at Whippany, N.J., where much of the ZEUS engineering system has been originated or perfected.

The ZEUS development program entails an extensive test firing program to include intercepts by ZEUS missiles fired from Kwajalein Island against ICBMs fired from Vandenberg AFB, Calif. From Ascension Island, 4,500 miles southeast of Florida, the target track range will track ICBMs fired from Cape Canaveral down the Atlantic Missile Range. Trajectory data will be recorded and fed into target intercept computers at White Sands and Point Mugu to provide synthetic targets for missile intercept firing tests.

To bring the NIKE ZEUS system to its present state of development, the Department of the Army has drawn heavily on the Nation's top brainpower for the past 3 years. Under the overall guidance of the Chief of Research and Development, with the Army Ordnance Missile Command serving as system manager, the Signal Corps, Corps of Engineers, Transportation Corps and the Ordnance Special Weapons Ammunition Command all are deeply involved in the effort.

Participants in recent discussions at Redstone Arsenal, Ala., regarding plans for important tests of NIKE ZEUS system included (left to right) Richard S. Morse, Director, Research and Development, Department of the Army; Rear Adm. J. P. Monroe, Commander of the PMR; Maj. Gen. August Schomburg, CG of the AOMC. Morse became an Assistant Secretary of the Army Mar. 3.

Hundreds of industrial subcontractors have contributed special talents, with the Western Electric Co. being the prime contractor and with the Bell Telephone Laboratories providing technical direction. The Douglas Aircraft Co. builds the ZEUS missile.

Complexity of the ZEUS system, calling for the most advanced technology typical of modern weapons systems, has demanded and received the closest cooperation of pure scientists, applied scientists, engineers, technicians and administrators at all levels of the Nation's scientific community. In-house capabilities of Technical Services laboratories have been coordinated and integrated for maximum results.

In view of recent Soviet tests in the Pacific which established a capability of accurately directing a ballistic missile 6,500 nautical miles, the NIKE ZEUS is considered the critical component of the U.S. Army's triple-threat defense against surprise nuclear warfare. The AJAX and the HERCULES are designed to nullify, in cooperation with other systems, the threat of nuclear warheads delivered by manned aircraft. The ZEUS is designed to prevent ICBMs and lesser ballistic missiles from reaching their targets.

Indicative of the confidence of Department of the Army leaders in the role that the NIKE ZEUS system is designed to take in strengthening the Nation's defenses is the planned program of training artillerymen to man it for operational readiness. The U.S. Army Air Defense School at Fort Bliss, Tex., has trained approximately 25,000 technicians in operating and maintaining the Army's present complex electronic weapons systems. It is prepared to provide the necessary military technicians for NIKE ZEUS.

Meanwhile 41 students, members of the NIKE ZEUS project team at White Sands, the Army Air Defense Command, the Army Air Defense Board and other agencies, are undergoing an 8-week course of intensive training at White Sands. Located adjacent to NIKE ZEUS equipment used in the testing program, the school is conducted by instructors from the U.S. Army Ordnance Special Weapons and Ammunition Command, Picatinny Arsenal, Dover, N.J., and Western Electric Co.

NIKE ZEUS is categorized by Army leaders as one of its most advanced "weapons of tomorrow"—perhaps an imminent tomorrow in which the future course of the world may be charted—and they are as certain of its success as they are of that tomorrow.

Pershing Missile Fired From Mobile Launcher

A Pershing ballistic missile was successfully test fired from its transporter-erector-launcher (TEL) at Cape Canaveral, Fla., late in January.

"Both stages fired as planned, and all test objectives were met," said Brig Gen Richard M. Hurst, Commander of the Army Ballistic Missile Agency (ABMA). He reported that instrumentation in the sharp-nosed surface-to-surface missile measured the reaction of the inertial guidance system components to extremes of shock, temperature, and stress.

Because its guidance system is completely self-contained, the solid-fuel Pershing is immune to countermeasures once it has been fired. TEL is also a self-contained unit designed to carry and erect the missile in the field.

The Pershing system will be transportable on fully tracked ground vehicles, by helicopter, or fixed wing aircraft. Its high mobility will enable it to go anywhere with the field Army.

AMBA is an element of the Army Ordnance Missile Command. It is technical supervisor of the Pershing development program. Prime contractor is the Martin Co., Orlando, Fla.

Nuclear Defense Laboratory Researches Method Of Protecting Troops From Battlefield Radiation

Broadened scope of responsibilities of the U.S. Chemical Corps Nuclear Defense Laboratory (NDL), designated a separate staff level activity of the Chemical Corps R&D Command last September, is indicated by its current work on 17 projects for the Defense Atomic Support Agency, formerly the Armed Forces Special Weapons Project.

Located at the Army Chemical Center, Md., the NDL's expanded function is an outgrowth of the Chemical Corps' need for a research program adapted to its mission of providing technical staff guidance to the Army in radiological defense. NDL efforts are apportioned to three major functions: initial radiation phenomenology, residual radiation, and shielding.

Importance of NDL's task is clear in view of the possibility of war on a nuclear battlefield. Survival then would become the most pressing problem facing the Army, including not only survival of the individual from a passive standpoint, but, more importantly, the maintenance of tactical integrity and combat effectiveness of large units faced with a nuclear environment.

In preparing for the nuclear battlefield situation, the Chemical Corps must determine in detail what radiation hazards will exist, what the specific nature of these hazards is, and how one may circumvent or protect against these hazards. To this end the Corps has participated in all the major nuclear weapon test operations at the Eniwetok Proving Ground and at the Nevada Test Site, and has conducted scientific experiments during many of the nuclear detonations.

While the nuclear testing was in progress, the major effort of the NDL was expended in support of the test program. Since suspension of the testing, greater emphasis has been placed on research and development areas, particularly the area of protection against radiation hazards.

Analysts Luther M. Hardin, Manfred Morgenthau and Edward F. Wilsey (l. to r.) compute nuclear fallout pattern as part of radiological research program of the U.S. Army Chemical Corps Nuclear Defense Laboratory.

One of NDL's most recent projects is a study of the disposal of nuclear reactor waste generated at such sites as Fort Belvoir, Va. Another project, commenced in January, is a series of experiments designed to test efficiency factors for cold weather decontamination. These studies are being conducted at Camp McCoy, Wis.

The newest addition to the Laboratory organization is the Health Physics Office, which serves the entire post at Army Chemical Center. A less well-known NDL activity is that of an organized and equipped PLUCON team. Its mission is to monitor and assess the hazard at any accident or incident involving the release of nuclear material under Army jurisdiction. The team is commanded by Capt Arthur L. Knipp, a nuclear (effects) engineer, who is also Chief of the Nuclear Physics Division and Acting Deputy Commander of the Laboratory.

A Cockcroft-Walton accelerator to be installed at the Laboratory this summer will permit a far broader range of in-house studies of basic and applied radiation phenomena. The installation, together with a completely automated counting trailer, will enable NDL to obtain and process data more rapidly.

Present commander of the Laboratory is Maj Heber C. Brill, a graduate of the U.S. Military Academy at West Point and the 3-year course at the U.S. Naval Post Graduate School and the University of California.

The Laboratory maintains active liaison with all Chemical Corps agencies and contacts with many widely known corporations concerned with nuclear defense work. In addition, many distinguished visitors, including visitors from other countries, tour the Laboratory and receive briefings on projects.

Director Morse Promoted To Assistant Secretary

Richard S. Morse, Director of Army Research and Development since June 1, 1959, was sworn into office as Assistant Secretary of the Army Mar. 3, by Secretary of the Army Elvis J. Stahr, Jr.

As Assistant Secretary, Mr. Morse will continue to be responsible for supervision of the Army R&D Program. No successor as Director will be named.

Mr. Morse came to the Army from the National Research Corp., Cambridge, Mass., which he organized in 1940 and of which he was president until his resignation in 1959. National Research Corp. is one of the country's principal suppliers of industrial vacuum equipment.

Generally recognized as a pioneer in high vacuum technology, Secretary Morse has been associated with many new technical enterprises growing out of research activities of National Research Corp.

Mr. Morse has served as civilian advisor to the Atomic Energy Commission and as a member of the Army Ordnance Research and Development Advisory Committee, the Technical Advisory Panel of the Department of Defense on Chemical, Radiological and Biological Warfare, the Army Scientific Advisory Panel and the Defense Science Board.

From October 1958 until May 1959 Mr. Morse was Chairman of the Army Scientific Advisory Panel. In 1959 he received the honorary degree of doctor of engineering from Brooklyn Polytechnic Institute.

Mr. Morse was born in Abington, Mass., Aug. 19, 1911. He received a B.S. degree from Massachusetts Institute of Technology in 1933 and did graduate work in physics at the Technische Hochschule, Munich, Germany. Subsequently he spent 5 years in research work at Eastman Kodak Co. and Distillation Products, Inc., at Rochester, N.Y.

ORO Summer Projects Draw Gifted Science Students

Exceptionally bright young science students are gaining practical knowledge of some of the career opportunities in Army science through a program of summer study projects initiated in 1956 and continued with mounting success by The Johns Hopkins University Operations Research Office, Bethesda, Md.

ORO studies are conducted under contract with the Department of the Army through the Chief of Research and Development. In line with the Army's expanding emphasis on career opportunities it offers to outstanding science students, the ORO program for high school boys and girls gives them a working insight into operations research techniques. They learn about and practice scientific methodology on problems in management decisions.

Participants are encouraged to display initiative and creativeness. While working within the scientific atmosphere of one of the Army's renowned research institutions, students are aided in deciding on careers by being brought into contact with the many scientific disciplines related to operations research.

Recruited from senior high schools within a 5-mile radius of ORO, selectees are chosen from those recommended by school principals invited to suggest students who meet specific criteria. Each school normally submits names of 8 to 10 students as candidates for the 24 spaces available each summer.

Final selection is made by a committee of five senior members of the ORO professional staff. The committee evaluates the academic records, teacher recommendations, and personal history, in addition to considering each student's oral proposal of a theoretical solution to a research problem.

Successful candidates, following a brief orientation on the internal organization of ORO, are asked to state their preference for participation in one of four selected projects capable of being completed within a 10-week period. The students are assigned to research teams consisting of six members each. One member is designated team leader and a member of the ORO professional staff is assigned to each as advisor.

The team is apprised of its problem area, advised of the facilities at its disposal and impressed with the fact that the end result, or research product, must meet the same professional requirements imposed on all projects within the ORO work program. From this point the research is the responsibility of the team and its members. They may obtain any materials necessary to the study, devise any means of collecting data and seek advice from any member of the staff, but the actual work and decision process is the sole responsibility of the team.

Student scientists work on operations research at Johns Hopkins ORO.

The function of the senior advisor is similar to that of the college professor who advises the graduate student on his thesis. He does not direct the research, but provides advice on methodology and sources of information. He reviews drafts of the research paper and the students' oral briefings, which are required at predetermined intervals during the study.

Teams are required to present a formal briefing at the close of the summer for all members of the ORO professional staff. This is conducted as a seminar during which the team orally presents its problem, methods of approach, decision processes, findings of the study, and justification. A final draft of the research paper is then submitted to the ORO Review Board.

Consisting of three senior members of the ORO professional staff, the board is assigned the responsibility of reviewing all research papers produced by ORO. The purpose is to judge the professional quality, propriety and soundness of the findings and to evaluate the paper's value to the Army.

Since the program's inception, students have completed 17 studies, from which 11 technical research papers have been published as official ORO documents. Of the remaining six, one is now being readied for publication, two have resulted in unofficial publication and three have provided valuable data serving as a basis for additional research. Three articles that appeared in professional scientific journals were based on research papers produced by ORO student teams.

Another indication of the value of the project lies in the fact that two participants in the ORO 1960 program were among the seven Maryland students who advanced to the Honors Group in the annual Science Talent Search sponsored by Westinghouse Electric Co. Thousands of high school students competed from all over the United States. Mary Shaw, 17, a senior at Walter Johnson High School, Bethesda, Md., and Steven Jordan, also 17, Montgomery Senior High School, Silver Spring, Md., were among the 399 selected in the Honors Group.

Dr. Ellis A. Johnson, Director of ORO, initiated the summer program following his studies of ways of mobilizing and utilizing more effectively the Nation's scientific manpower potential in educational institutions. Backed by knowledge of the major contributions in creative science made by Galileo, Pascal, Halley, Euler, Fourier, Gauss and many others at the early ages of 15 to 21, he concluded that creativeness is not confined to any age group.

Now that the ORO program is advancing into its sixth year of operation, Dr. Johnson can glean personal satisfaction from the accomplishments to date and the future potential of many students who have participated. In a recent letter Steven Jordan said:

"Much of my interest and incentive in science was stimulated by my experience in the ORO program, and by the counseling and assistance I received from the professional scientists engaged in ORO studies."

Electrical Anesthesia Unveils Great Potentiality

Surgery patients in the future may be anesthetized in seconds by electrical current, if further investigations sustain the promise of four successful operations on humans in January.

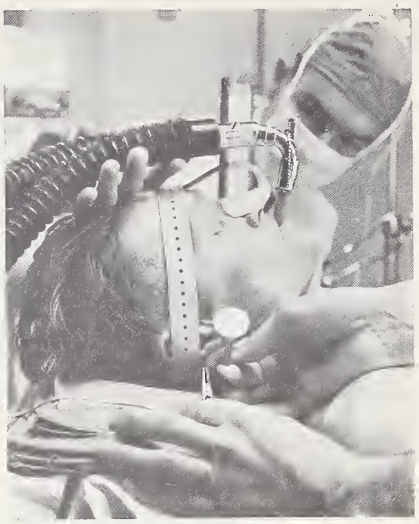
Potentially of tremendous significance for military as well as civilian medical applications—notably for surgery under combat conditions—the electrical impulse technique is being developed under contract with the U.S. Army Medical Research and Development Command.

Dr. James D. Hardy is cautious in his comments about how soon the new method will be ready for general use. Preliminary tests have satisfied all expectations, he said. The four operations were performed at the University of Mississippi Medical Center, Jackson, Miss., where Dr. Hardy is Professor and Chairman, Department of Surgery, and Director of Surgical Research.

Within seconds after the current was turned on (700 cycles as compared to the 60 cycles used for domestic purposes), patients were shocked into varying stages of unconsciousness. They awakened seconds after the current was turned off, without the undesirable after-effects of other types of anesthesia.

"One hesitates," Dr. Hardy said, "to predict what the future of this technique may be. On one hand it may prove to have limited usefulness. But on the other hand, if preliminary results are substantiated by more extensive clinical tests, current practices of anesthesia could be revolutionized.

"One fact is certain. This successful clinical application of the method in the first four patients opens up an entire new field for neurophysiological investigations in man.



Electrodes are placed against head of simulated patient in demonstration of new electric anesthesia technique under development by Dr. J. D. Hardy.

"Patients were singularly free of nausea and similar discomforts. The first patient recalled nothing of the operation. The second patient thought she had heard voices but felt nothing. The third patient would open his eyes on command and nod 'No' in response to questions as to whether he felt anything. Later he had no memory of the operation, though he remembered everything up to the time the electrical current was turned on."

All patients operated on while under electrical anesthesia are subjects of long-term follow-up studies by the Department of Psychology and Neurology at the University of Mississippi Medical Center. Dr. Hardy is directing the studies as part of his work in surgical metabolism and trauma under the Army contract. Dr. M. Don Turner, physiologist, and electronics technician C. Don McNeil are assisting.

Preliminary to the operations on humans late in January, Dr. Hardy conducted experiments on 15 dogs to determine the effects of electrical narcosis of 6 to 8 hours duration upon blood gas values, blood pressure, neuroendocrine response, and survival. Observations were made on the animals prior to, during, and after the abrupt recovery which follows cut-off of the current.

Initially the procedure produces a marked rise in blood pressure, but in most experiments this hypertension has declined to essentially normal levels favorable to surgery. A progressive metabolic acidosis usually develops, but no serious gross effects have been noted. Prolonged periods of electrical narcosis have been well tolerated.

Electrical anesthesia equipment costs about $150 and consists of an oscillator which provides current through an amplifier connected to the patient's temples by electrodes about the size of a half-dollar. To insure unobstructed breathing, an "airway tube" is inserted, and to eliminate the discomfort of this process the patient's mouth is sprayed with a local anesthetic.

Dr. Hardy started his studies on the effects of electrical anesthesia on animals 4 years ago. Despite the consistent satisfactory results, including the latest experiments on humans, he believes that at least another year of clinical trials will be needed to substantiate thoroughly the soundness of the system for widespread adoption.

Gates, Douglas Bid Adieu, Thank Services for Support

Outgoing Secretary of Defense Thomas S. Gates, Jr., and Deputy Secretary James H. Douglas joined in the following farewell message to all members of the U.S. Armed Forces:

"We deeply appreciate the opportunity to have worked closely with the U.S. Armed Forces and we are most grateful for the friendliness and the many courtesies and kindnesses extended to us. We consider our association with the members of the U.S. Armed Forces during our service with the Defense Department one of the most stimulating and satisfying experiences of our lives. We will continue to follow with keen interest the problems of national security and the activities of the U.S. Armed Forces and will strongly support them in carrying out their vital missions of defending the United States and the Free World."

Army Meteorological Liaison Group to Meet

The Army Meteorological R&D Coordination Committee, formed slightly more than a year ago to provide for technical coordination and dissemination of information on Army meteorological research and development, will hold its fourth meeting in Washington, D.C., April 3–5.

Subjects for discussion are "Meteorological Aspects of Environmental Research" and "Army Requirements for Basic Research in Meteorology." The first subject will be discussed at a joint session with the Army Committee on Environment, Panel on Environmental Research.

The Committee's previous meetings resulted in valuable coordination and technical exchange in such areas as meteorological equipment development, local (small scale) meteorological research, ballistic meteorology, and fallout meteorology.

Army problems in meteorology arise from atmospheric effects on artillery ballistics and sound ranging corrections, employment of free-flight rockets and nuclear weapons, use and interpretation of the output of combat surveillance sensors, performance of light aircraft and drones, and many other Army operations.

The Army Meteorology R&D Committee has 26 members and 21 alternates. These are technical representatives of the Office of the Chief of Research and Development, USCONARC and its field agencies which are concerned with meteorology, and most of the Technical Service headquarters and their appropriate field agencies.

AOMC Lab Simulates Environmental Stress For Missile Testing

Every environment which a missile may be expected to encounter from the time it is produced until it soars aloft will be at hand in the new testing laboratory at the Army's Redstone Arsenal, Ala.

Built for the Army Rocket and Guided Missile Agency, an element of the Army Ordnance Missile Command, the new $3.5 million laboratory was designed to house under one roof the most comprehensive facility in the free world for environmental testing of live missiles. It will be operated by ARGMA's test and evaluation laboratory, and will be available for testing missiles and missile components of other services, Government agencies, and industrial missile contractors.

Technicians will be able to expose test items ranging from tiny components to complete missiles up to 36 feet long and 8 feet in diameter. The building is divided into chambers for specific tests.

A missile given the complete test will be shaken, vibrated, spun, balanced, measured, and weighed. It will be exposed to temperatures ranging from −80° to 180°, X-rays, fungus growths, ultra violet light, drenching rain, salt spray, sand and dust storms, high altitude conditions, and steam baths.

Using hydraulic jacks, a test crew will be able to subject a test missile to the same stress and strain as encountered by a missile in flight. Records radioed to the ground from a flight test missile that has experienced structural failure can be used to re-create the flight conditions in the laboratory to determine the reason for failure.

As a safety measure, walls of the test cells are at least 1 foot thick and made of concrete reinforced with steel. Technicians may watch some of the tests in progress through portholes in the cell walls. The glass is several inches thick. Other tests can be monitored by television cameras under remote control.

Searchlight Used as Solar Furnace

An ingenious use for surplus Army searchlights has been devised by the electric boat division of the General Dynamics Corp., which has utilized one as a solar furnace. The 60-inch searchlight, once part of an antiaircraft battery, reflects the sun's rays to a focal point with a temperature of 6,500° F. The furnace is used to determine hitherto unknown melting points of metals used in the building of submarines, nuclear reactors, missiles, and space vehicles with good results to date.

Col Entwhistle Heads Ordnance Ballistic Labs

Col R. R. Entwhistle

Appointment of Col Richard R. Entwhistle as Director of the Army Ordnance Corps Ballistic Research Laboratories was announced recently by Brig Gen John H. Weber, Aberdeen (Md.) Proving Ground Commander.

The Ballistic Research Laboratories conduct basic and technical research in ballistics and in the related fields of physics, chemistry, mathematics, and engineering. A staff of 600 scientific specialists render otherwise unavailable technical services to the Ordnance Corps, to other Government agencies, and to their contractors, in the fields of interior, exterior, and terminal ballistics, instrumentation for ballistic measurements, computing techniques, weapon systems analysis and development, and quality control.

They also provide expert consulting services in connection with the design of new weapons, the more effective use of existing ones and suggested avenues for research and development which will lead to new weapons. Additionally, the Laboratories prepare ballistic tables for guns and rockets and information regarding their effects when used in combat.

A 1935 graduate of the University of Cincinnati, where he received his degree in chemical engineering, Col Entwhistle is one of the Ordnance Corps experts in the fields of nuclear weapons and application of nuclear power. He has also done postgraduate work at the University of Virginia, Stanford University, the Naval Postgraduate College, and Ohio State University. He received his master's degree in physics from Ohio State University.

During World War II he served in Panama and in the Pacific, with the 24th Infantry Division in the latter theater. He organized and headed the Nuclear Weapons Special Components Branch, Chief of Research and Development, Office of the Chief of Ordnance. For the past 18 months he has been Special Assistant to the Chief of Ordnance for Nuclear Application.

Chemical Corps Appoints Dr. Murray Chief Scientist

An outstanding petroleum scientist, Dr. Maurice J. Murray, chemical consultant to the Universal Oil Products Co., Des Plaines, Ill., became Chief Scientist of the Army Chemical Corps on March 1.

Before joining Universal Oil Products, Dr. Murray was professor of chemistry and acting chairman of the chemistry department at the Illinois Institute of Technology, Chicago. From 1930 to 1939 he was head of the chemistry department, Lynchburg College.

A graduate of Depauw University, Greencastle, Ind., where he received his B.A. degree in 1925, Dr. Murray was awarded a Ph. D. degree by Cornell University in 1929. He holds 12 patents in petroleum refining.

Ruina Named ARPA Director

Dr. J. P. Ruina, Assistant Director of Defense Research and Engineering since last May, has been named Director of the Advanced Research Projects Agency. He succeeds Brig Gen Austin W. Betts who was named director of military applications for the Atomic Energy Commission.

Dr. Ruina has been responsible for the technical evaluation and integration of defensive weapons systems and for planning and supervising research and development of new systems, including antiaircraft, antimissile missiles and interceptor aircraft.

Maj Gen Griffing Gets New Duty

Maj Gen Lewis S. Griffing, Deputy Commander of the Fourth Army at Fort Sam Houston, Tex., will take command of the Army Artillery and Missile Center and Artillery and Missile School at Fort Sill, Okla., April 1.

Assigned to Medical R&D Staff

Maj James Beyer, MC, has been assigned to the Army Medical Research and Development Command as Assistant Chief of the Surgical Research Branch, involving supervision and evaluation of research projects concerned with trauma, shock, and blast.

Assigned part-time during the past 2 years to the Army Chemical Center, Edgewood, Md., and to the Armed Forces Institute of Pathology, he has represented the Medical R&D Command and The Surgeon General at a number of conferences concerned with wound ballistics and body armor.

Army's Experimental Rubber Meets Exacting Tests, Interests Government Agencies in Potential Uses

Top governmental agencies, including the National Aeronautics and Space Administration and the Atomic Energy Commission, are interested in possibilities of meeting many critical requirements with an experimental nitroso rubber being developed under Department of the Army contract.

Extensive tests substantiate claims that the new product is a dramatically significant breakthrough in the Army's search for a synthetic rubber that is nonflammable, flexibly usable at temperatures as low as 40 degrees below zero F., and resistant to deterioration by hydrocarbon fuels and strong oxidizers.

Synthesized by the Minnesota Mining & Manufacturing Co. under contract with the Quartermaster Research and Engineering Command, the test product has satisfied early expectations regarding most basic requirements and presently is the only known nonflammable rubber, a report said.

Admittedly in the "preliminary stages of research, development, testing and evaluation," the new rubber is expected by researchers to "open up areas of tremendous importance in the field of elastomers."

Among potential uses of the experimental product accounting for the interest of the National Aeronautics and Space Administration, the Atomic Energy Commission and the Army Ballistic Missiles Agency, are as a coating for fabrics in rockets and missiles and as a binder for solid fuel propellants. Another important use would be in flexible, easily transportable and quickly laid pipelines for petroleum products delivery under all conditions of terrain and climate.

Dr. J. C. Montermoso of the Quartermaster Research and Engineering Laboratories at Natick, Mass., said he has received inquiries from many sources since he presented a paper titled "Structure and Properties of Nonflammable Nitroso Rubber." The presentation was made at the Army Symposium of the American Institute of Chemical Engineers in Washington, D.C., in December 1960.

Army-industry-university teamwork, in line with the Army's increasing emphasis on utilizing to the fullest extent possible the resources of the general scientific community to expedite critical research and development objectives, will be involved in further studies and tests of the nitroso rubber—as stated by Dr. Montermoso, "in the synthesis of monomers."

Cooperating in what is projected as a substantially expanded program of research and development of the nitroso rubber, including problems of mass production to achieve economical cost, are the Quartermaster Corps, Minnesota Mining & Manufacturing Co., University of Florida, and University of Colorado. Dr. Montermoso said he has requested $300,000 additional funding, and that much more may be needed.

Natural rubber and most synthetic rubbers, Dr. Montermoso said, have carbon-carbon links (-C-C-C-C-) in the molecular backbone. The experimental rubber has a heteroatomic structure (-N-O-C-C-) as the repeating unit in the molecular chain, and is the only known synthetic rubber without a hydrogen element. It is described as a copolymer of trifluoronitrosomethane and tetrafluoroethylene, with desirable vulcanizing properties.

The field of elastomers is being investigated by numerous Army in-house facilities and through contracts and grants with universities, nonprofit research institutions, and commercial research enterprises.

Synthetic nitroso rubber, only known nonflammable rubber, promises to open vast field of usage, from petroleum pipeline to space vehicles.

As stated by Dr. Zachary T. Ossefort of the Elastomer Unit, Rock Island Arsenal Laboratory, U.S. Army Ordnance Weapons Command, "With the advent of the Space Age, the use of elastomers on rockets, satellites, and other space vehicles seems to be assured.

"Such use may involve exposure to conditions in outer space for relatively long periods. At the present time our knowledge regarding the effects of space exposure on elastomers and other organic materials is very meager. A program aimed at determining the effects on elastomers of long-term exposure to a simulated space environment is currently underway at the Rock Island Arsenal rubber laboratory. Both general purpose and specialty rubbers are being exposed to temperatures ranging from —100° F. to 1100° F. and at atmospheric pressures corresponding to simulated altitudes of approximately 75 to 125 miles. Exposure to ultraviolet radiation and dynamic testing within a vacuum also are being contemplated."

Army Awards Contracts For Gas Turbine Truck

The Army has awarded contracts to the Ford Motor Co. and the Chrysler Corp. for development work on turbine powered trucks, Lt Gen Arthur G. Trudeau, Chief of Army Research and Development, told the members of the Society of Automotive Engineers at a recent meeting in Detroit.

General Trudeau said that gas turbine engines are the best prospects for Army vehicle power plants within the next few years and that by the 1970's fuel cells are expected to be the main power sources of automotive engines. He said the military is interested in fuel cells because their efficiency is expected to be twice that of gasoline engines, they are quiet, have no moving parts, and are suited to field use.

Newsmagazine to Feature Management Information

"Management Memo" will appear as a regular feature in forthcoming issues of the *Army Research and Development Newsmagazine*. Easy identification will be insured by a distinctive heading and format.

Intended to stimulate and provide guidance for the thousands of personnel concerned with some phase of Army R&D management, the Memo will consist of very concise items on policies and procedures, improvement of facilities, morale and welfare activities, contracts and funding.

To illustrate possibilities of management improvement for those who may have similar problems or responsibilities, the Memo will call attention to successful practices in Army or contractor laboratories and other facilities.

Scientists, engineers, technicians, and administrators are reminded that "Efficient Management Is Everybody's Business," and that their cooperation is needed to insure an adequate flow of items for the Memo. Items must be channeled through local technical liaison or public information offices, addressed to the *Army Research and Development Newsmagazine*.

New Recording Device Seen As Important Future Factor In Processing Missile Data

A new technique of recording and storing information was recently demonstrated for engineers and technical personnel at the White Sands Missile Range, N. Mex.

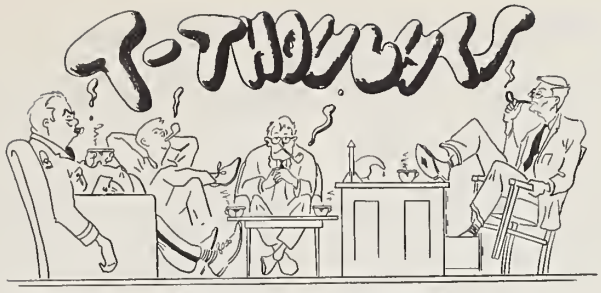
The technique, called thermoplastic recording, uses electronic means for recording but can be read out either electronically for analog or digital computer usage or optically for direct image projection.

A hybrid development of both photographic film and magnetic tape, combining some properties of both, thermoplastic film has many advantages over either. It is capable of recording more data more accurately and rapidly in less space than either of its predecessors.

Materials used for thermoplastic records are somewhat similar to a highly specialized film, but without chemical emulsion. An image is obtained in the form of an electrical charge. Heating the thermoplastic develops the image in less than 1/15th of a second. The process can be repeated thousands of times before the film is no longer usable.

Thermoplastic recordings may be the long-sought connecting link between optical and electronic data, in the opinion of a WSMR electrical engineer. It is not anticipated that it will be an item for immediate use at WSMR, but is expected to become, within the next few years, an important factor in high-speed recording of vast quantities of missile data.

A special application of thermoplastic recording will be a digital storage plate able to store 80 million bits of information per square inch, any of which can be erased and updated.



By Dr. Ralph G. H. Siu

In listening to R&E solicitations, it is frequently difficult to stick to the purpose at hand and the facts of the case. This requires a clear distinction between the poor salesman with nothing worthwhile, the poor salesman with something worthwhile, the good salesman with nothing worthwhile, and the good salesman with something worthwhile.

The unwary can be trapped readily by a convincing argument from a polished salesman with an actually inferior proposal. Conversely, he may miss a gem from the poor salesman.

In this respect, you may be interested in the following excerpt from a letter by Lord Chesterfield (1694–1773) to his son:

"I acquainted you in a former letter, that I had brought a bill into the House of Lords for correcting and reforming our present calender, which is the Julian; and for adopting the Gregorian. . . . I consulted the best lawyers and the most skilful astronomers and we cooked up a bill for the purpose. But then my difficulty began: I was to bring in this bill, which was necessarily composed of law jargon and astronomical calculations, to both which I am an utter stranger. However, it was absolutely necessary to make the House of Lords think that I knew something of the matter and also to make them believe that they knew something of it themselves, which they do not. For my own part, I could just as soon have talked Celtic or Sclavonian to them as astronomy, and they would have understood me full as well: so I resolved to do better than speak to the purpose and to please instead of informing them, I gave them, therefore, only an historical account of calenders, from the Egyptian down to the Gregorian, amusing them now and then with little episodes. But I was particularly attentive to the choice of my words, to the harmony and roundness of my periods, to my elocution, to my action. This succeeded, and many of them said that I had made the whole very clear to them; when God knows, I had not even attempted it."

AEPG Tests Mobile Communications Center

Preproduction tests of a new mobile communications center are being carried out jointly by the Army, the U.S. Marine Corps, and technicians from Collins Corp. of Cedar Rapids, Iowa, at the Army Electronic Proving Ground at Fort Huachuca, Ariz.

Designed by the Collins Corp., the center is much more compact than the Army's AN/GRC–26, according to Capt Alvin Davis of the Engineering Division of the Signal Communications Department at the Proving Ground. Termed the "workhorse" of the Army as far as a mobile communications center is concerned, the GRC–26 is normally mounted in a 2½-ton truck; the new center takes a ¾-ton truck.

Capt Davis said that one man using the new unit can do the work of three men required for the GRC–26. The new center is capable of handling three radio conversations and four teletype conversations simultaneously. The GRC–26 handles only one radio and one teletype conversation at a time.

"We believe the new equipment can be operated at distances up to 100 miles as compared with the GRC–26's capability of 50 to 100 miles," he said.

Heading the Marine Corps' 21-man detachment for the test is Capt Jack Bouvy of the Marine Corps Landing Force Development at Quantico, Va.

Working in round-the-clock shifts with the Marines are more than 70 Army Signal Corps personnel from several units at the Proving Ground.

Army Ballistics Authority Dr. Robert H. Kent Dies

The distinguished career of Dr. Robert H. Kent, who gained many honors as one of the Nation's leading ballistics experts, ended with his death early in February. Until his retirement in 1956, Dr. Kent served for many years as Associate Technical Director of the Army Ordnance Ballistic Research Laboratories at Aberdeen, Md.

Recognition of Dr. Kent, a Harvard University graduate, came in the form of the Presidential Medal for Merit awarded by President Truman in 1946, the Potts Medal of the Franklin Institute in 1947, and the Campbell Medal of the American Ordnance Association in 1955. He was also recipient of the Exceptional Civilian Service Award of the Department of Defense.

In charge of ballistic work and responsible for preparation of firing tables for the use of American artillery in Europe in World War II, Dr. Kent served later as chairman of the Explosives and Armament Panel, U.S. Air Force Scientific Advisory Board, and was a member of the Advisory Board, Naval Ordnance Test Station, Inyokern, China Lake, Calif.

Dr. Kent was a fellow of the American Association for the Advancement of Science and of the American Physical Society, and a member of the Institute of Mathematical Statistics, the Institute of Aeronautical Sciences, the National Academy of Sciences, and Phi Beta Kappa.

Dr. Weeks Exercises Talents as Scientist, Teacher, Author in Her OMRO Staff Duties

As staff adviser to the Director of the Ordnance Materials Research Office, physicist Dr. Dorothy W. Weeks makes available to the Army's Research and Development program a reservoir of scientific knowledge and experience that is both deep and broad. She is recognized widely as one of the ablest standard bearers among the women blazing a bright trail in Army science.

A graduate of Wellesley College, Dr. Weeks received a master's degree in physics from the Massachusetts Institute of Technology and was the first woman awarded a Ph. D. in mathematics by the Institute. From 1920 to 1924 she was a member of the Physics Department staff at M.I.T., serving the last 2 years as instructor of physics. She also taught for a year at Wellesley.

Earlier she served as an assistant examiner in the U.S. Patent Office, the third woman to receive such an appointment, and for a short time she worked at the National Bureau of Standards.

From 1930 until World War II, Dr. Weeks was professor of physics and chairman of the Physics Department at Wilson College. Then she served as a member of the technical staff of the Liasion Office of the Office of Scientific Research and Development (OSRD) from July 1943 to December 1946. All scientific and technical documents received by OSRD from America's allies and from U.S. laboratories in England were distributed by Dr. Weeks' staff to persons who could profit most from them.

This task required her to visit numerous wartime research laboratories and installations, including the Radiation Laboratory at M.I.T., the Radio Research Laboratory and Underwater Sound Laboratory at Harvard, the Optics Laboratory at the University of Rochester, the U.S. Navy's David Taylor Model Basin, the submarine base at New London, Conn., and the Naval Training School at Newport, R.I.

Dr. Weeks also represented the OSRD Liaison Office on Applied Mathematics and Applied Psychology Panels, assisted with the Radar and Penicillin Exchange Plans, and attended meetings of the Tropical Deterioration Committee and of Division 1, Ballistic Research, National Defense Research Committee. Her work won her the Army-Navy Certificate of Merit.

When the war ended she returned to Wilson College, where she resumed her research in fundamental atomics spectroscopy, particularly the determination of the Landé g values. In 1944 Dr. Weeks was joint author of a monograph on the "Arc Spectrums of Iron (FeI)," published in the *Transactions of the American Philosophical Society.* A paper on "The Zeeman Effect" reported her research in this field.

In 1949–50, as holder of a Guggenheim Fellowship and while on sabbatical leave from Wilson College, she was a guest at M.I.T. and visited the Zeeman Laboratory in Amsterdam, Bohr's Laboratory in Copenhagen, and three Swedish institutions of learning, The University of Lund, the Nobel Institute in Stockholm, and the University at Uppsala. That same year she determined the Landé g values for FeII, CoI and II, and Zr II and III, all reported in "Atomic Energy Levels," Circular 467, National Bureau of Standards.

Dr. Dorothy W. Weeks

While at Wilson College, Dr. Weeks established a major in physics and developed a well-equipped spectroscopy laboratory. A number of her students went on to graduate work, two receiving doctoral degrees from M.I.T. She joined OMRO in June 1956, after serving 3 years as consultant with the National Science Foundation, where she assisted with the physics program.

Dr. Weeks has traveled widely in the United States, Canada, and Europe. A member of Phi Beta Kappa and Sigma Xi, she has served on the fellowship awards committees of the American Association of University Women (AAUW) and the International Federation of University Women (IFUW), and was first chairman of the AAUW International Grants Committee. From September 1945, when the AAUW brought six women from occupied countries to the United States for study, until 1955, when Dr. Weeks retired as chairman of the grants committee, more than 300 women, representing every country with an affiliate of the IFUW, were brought to this country for study.

For recreation, Dr. Weeks has engaged extensively in mountain climbing, particularly in New Hampshire's White Mountains where for some years she has spent her vacations in a log house deep within an old spruce grove.

Maj Evans Wins Decoration For Outstanding Polar Work

Maj Thomas C. Evans, former Assistant Operations Officer of the U.S. Army Polar Research and Development Center, was recently awarded the Army Commendation Medal for meritorious service in Greenland. He is now Staff Officer in the Nuclear Energy and Effects Branch of the Atomic Division in the Pentagon.

The accompanying citation stated, in part, that the Engineer Corps Officer ". . . distinguished himself by exceptionally meritorious conduct in the performance of outstanding service during the period from 29 February 1959 to 29 August 1960. As Assistant Operations Officer, U.S. Army Polar Research and Development Center and Camp Commander, Camp Century, Greenland Ice Cap, Capt Evans displayed outstanding managerial ability, initiative, and technical proficiency in the planning and construction of the first nuclear powered under-ice camp to be installed by Army troops. . . ."

"- and this advanced feature is for use in case the self starter fails."

Polar Team Gets "Caribou"

With the approval of the Office of the Chief of Research and Development, the U.S. Army Polar Research and Development Center's Aviation Section recently acquired two AC–1 "Caribou" transport aircraft to support the 1961 Army Polar R&D programs in northern Greenland. The "Caribous" will supplement the four helicopters and two fixed-wing "Otters" the Aviation Section used in 1960.

White Sands Range Set To Help Monitor Flight Of Man-in-Space Capsule

Radar tracking and ground instrumentation equipment at the White Sands Missile Range, N. Mex., is about ready to mesh into the worldwide network of 17 stations set up by the National Aeronautics and Space Administration to monitor the progress of the man-in-space capsule the NASA hopes to place in orbit around the earth later this year.

In addition to its long-range radar, acquisition aide unit and other communication facilities, the WSMR will operate a tracking station near Corpus Christi, Tex., manned chiefly by land-air personnel transferred from WSMR.

The equipment will be able to provide data such as the rate of speed, angle of capsule, temperature in capsule, rate of astronaut's heartbeat, pulse, and some 100 different channels of information. Data will be transmitted automatically to the Goddard Space Flight Center near Washington, D.C., for processing in electronic computers.

In the opinion of George W. Fariss, Jr., civilian Army engineer who heads the Project Mercury work at WSMR, tracking data provided there may be a key factor in accomplishing the objective of recovery of the capsule and the astronaut.

Army officials noted that WSMR is making a valuable contribution to the man-in-space project by providing experienced personnel and range operation know-how to an undertaking that is expected to continue throughout years to come.

Frankford Arsenal Calls PAD Symposium May 17–19

Propellant actuated devices (PAD) will be discussed at a technical symposium May 17–19 at Frankford Arsenal, Philadelphia, Pa.

Sponsored by the Research and Development Division, Office of the Chief of Ordnance, Department of the Army, the symposium will be limited to selected scientists and engineers of the military services and other Federal Government agencies.

Objectives are: To stimulate technical communication among Government users and developers of PAD, including reports on current progress and planned activities. To discuss future military and space equipment systems to which PAD technology may be applied. To determine areas where new or additional research is required to advance the state-of-the-art.

Developers and users have been asked to provide exhibits of their devices, equipment systems, and concepts for the future. William H. Simmons of the Frankford Arsenal Pitman-Dunn Laboratories Group is the coordinator.

Formal presentations will be made by conferees relative to progress on projects, facilities used, reliability approach, and novel concepts of PAD applications. At the closing session, a panel will discuss the presentations and delineate research required to advance the state-of-the-art in an orderly and expeditious manner. Proceedings, including the panel discussion, will be published and distributed.

Propellant actuated devices were conceived originally and developed for aircrew escape systems. New applications are being found in an increasing variety of equipment systems requiring high thrust and extremely high reliability. The PAD family is proving that in many instances it offers substantial improvements over hydraulic and pneumatic systems and devices.

Since 1947 the Ordnance Corps' Frankford Arsenal has served as a center of joint military research and development of PAD. Government and industry depend on the center for coordination of effort, technical assistance, and exchange of information on the state-of-the-art.

Remarkable inter-service cooperation is advancing PAD. Under a formal agreement between the Air Force and the Ordnance Corps, the latter is considered to be "the principal development source of PAD for specific flight vehicle application."

The Ordnance Corps is charged with responsibility for close liaison with Air Force weapon system contractors, who are authorized to call directly on the Corps for assistance as required. Similar liaison is maintained with the U.S. Navy research and development activities to minimize duplication of effort.

Col MacKusick Assigned to Cape Canaveral

Col Arthur L. MacKusick, Chief of the Integrated Range Mission at White Sands Missile Range, N. Mex., from January 1959 until last month, is now Chief of the Atlantic Missile Range Army Field Office at Cape Canaveral, Fla.

Col MacKusick's predecessor, Col B. R. Luczak, left White Sands to take command of Army missile facilities at the Pacific Missile Range.

The Integrated Range Mission provides missile test scheduling, data gathering and reduction and missile recovery services for the Army, Navy and Air Force users of the 4,000 square-mile range.

Prior to 3½ years of service in Korea, Col MacKusick was executive officer and later acting chief of the Ammunition Branch, Army Ordnance Research and Development, Washington, D.C. Commissioned an Ordnance Corps reserve officer upon graduation in mechanical engineering at Massachusetts Institute of Technology, he was integrated into regular Army in March 1947.

Col Arthur L. MacKusick

USAERDL Honors Five For Outstanding Work

Four employees at the U.S. Army Engineer R&D Laboratories and one at the Geodesy, Intelligence and Mapping R&D Agency at Fort Belvoir, Va., were honored recently for outstanding work.

USAERDL awards were: Samuel E. Lytle, "Outstanding" and "Sustained Superior Performance," including $250 cash, in recognition of work in the Evaluation Branch; Richard L. Buttery, "Sustained Superior Performance," including $250 cash, for work in the Standardization Branch; Mrs. Helen Gordon, Mine Detection Branch, and Mrs. Doris E. Edwards, Machine Branch, "Sustained Superior Performance" certificates and $100 each. Kent T. Yoritomo received $250 cash and a "Sustained Superior Performance" certificate for his work in the Map Compilation Branch, GIMRADA.

Alaskan Cargo to Roll On 10-Feet-High Tires

Tires 10-feet-high and each weighing 3,200 pounds with rim—the world's largest—have been shipped to Alaska from Akron, Ohio, by the Goodyear Tire & Rubber Co. for use in the Army's "Willow Freeze" exercises.

The tires are for cargo trailers developed and built by the Transportation Corps to replace slow moving, heavy sleds previously used to haul cargo over snow-covered areas. By using tires instead of runners, carriers can operate on any off-road terrain.

ARO Foreign Research Program Broadens Payoff Base

Impregnable logic—that the continued world crisis requires the united skills of the best scientific and technological authorities of the free nations for the building of an impregnable defense, militarily, economically and politically—explains the U.S. Army's accelerated foreign research program.

The European Research Office (ERO) was established in Frankfurt am Main, Germany, by authority of a Department of the Army letter dated April 25, 1956, followed on May 15 by Army Regulation 70–40 defining ERO's mission and prescribing operational policies and procedures. Since then the Army program has been extended into 13 European nations and is funded currently at nearly $1½ million annually.

Established along the same lines as ERO, the Far East Research Office (FERO) began operations in May 1959, headquartered at Camp Zama near Tokyo, Japan. FERO activities presently are limited to the area of medical science. In Europe the range of investigation includes the biological sciences, chemistry, engineering, mathematics, physics, materials, social and behavioral sciences, and the medical sciences. Army research in Latin America is now being initiated on a broad basis.

Overall monitoring control of foreign research is vested in the Army Research Office, Office of the Chief of Research and Development. Wherever Army research is conducted in foreign lands, a primary objective is to make it constantly alert and immediately responsive to the requirements outlined by the Army Research Office and the seven Technical Services.

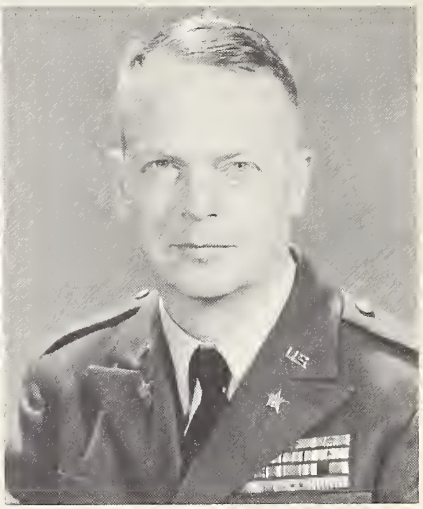
Interested in foreign research, and the formulation of general operational policies and procedures, are some 20 United States agencies, Government and private. Included are the President's Science Advisory Committee, Department of State, Department of Defense, Federal Council for Science and Technology, and the National Science Foundation.

The three C's of the Army's foreign research activities are cooperation, coordination, and concerted planning. Close liaison is maintained with numerous other organizations as the situation dictates during the normal course of operations.

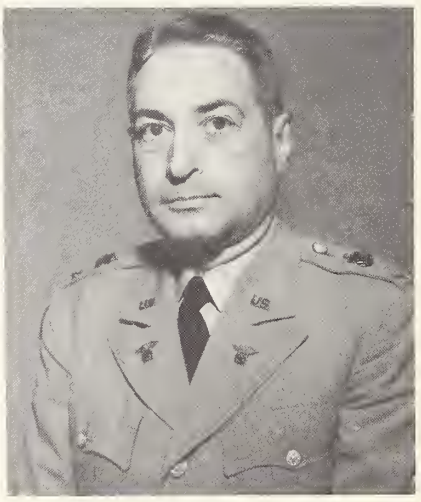
Insofar as the U.S. Army, Navy, and Air Force research activities in Europe are concerned, a determined effort is made to keep each other aware at all times of the proposals and contracts under consideration or in being. To minimize duplication of research and gain maximum results through integrated effort, information is exchanged at Tri-Service Coordination meetings held at regular intervals.

Similarly, the Army European Research Office coordinates activities with the Mutual Weapons Development Team in Paris, the Advisory Group for Aeronautical R&D of the North Atlantic Treaty Organization, the NATO Science Advisor, the U.S. Army Standardization Group in London, and the U.S. Department of Agriculture European office in Rome.

Liaison is likewise maintained with the World Health Organization office in Geneva, Switzerland, with all interested U.S. Army Headquarters in Europe, Military Assistance Advisory Groups in the 13 nations joined in the Army program, as well as the attaches in their embassies, and with other Army activities having research and development responsibilities.



Col Charles D. Y. Ostrom, Jr., Chief, European Research Office



Col Charles S. Gersoni, Chief, Far East Research Office

Operation of ERO has established a pattern to be followed in other areas. ERO is staffed with five Army officers, five U.S. civilian or professional personnel, two enlisted men, a secretary and seven German employees. This relatively small staff, however, has a review and analysis competency in biology, medicine, engineering, chemistry, physics, theoretical physics, mathematics, space technology, aeronautics, metallurgy, meteorology, geography and climatology.

Among the European nations merging their scientific talents in the Army research program are the United Kingdom, Western Germany, France, Italy, Ireland, Sweden, Spain, the Netherlands, Norway, Switzerland, Belgium, Denmark, and Greece.

Army objectives in the Far East and Latin America are substantially the same as in Europe and other areas to which the program will be expanded, specifically:

To broaden the base of potential payoff; to consolidate all available know-how on subjects most attractive and important to overall program requirements; to unite the scientific talent of the Free World and stimulate the flow of communication, thereby cross fertilizing cooperative effort in keeping with the swift advance of science and technology throughout the world; to create and maintain a maximum capability for the exploitation of any scientific breakthrough that might enhance mutual military defense.

The primary interest of the European Research Office is in the field of unclassified basic research, which may or may not have any specific aim as far as end products are concerned. It is research devoted solely to the expansion of knowledge in a particular scientific discipline, backed by the expectation through experience of the best technological forecasting experts available that the information will serve a military purpose at some future date.

Dr. Harold C. Weber, Chief Scientific Advisor, Office of the Chief of Research and Development, has been quoted as saying: "The Army is concerned with all areas of scientific investigation, and any scientific information may be of immediate or long-range value to the Army.

"Our business is not only to wage war. Our interest in science is related to all human problems. No other organization within my knowledge has the broad interest in all areas of scientific research and development the Army must have to do its job of pro-

QM Considers Power-Operated "Superman" Suits for GIs

A proposal to equip Army troops with a power-operated mechanical suit or skeleton that would transform the ordinary GI into a Superman is under consideration by the Quartermaster Corps.

The concept visualizes a mechanical structure with a self-contained fuel supply and power source, which could increase its wearer's strength in much the same manner as power steering and power brakes in the operation of an automobile.

The soldier's hand, arms, and legs would be encased in power-operated metal "limbs." Normal responses and senses of the wearer as he moved his limbs would automatically control and guide the movements of the mechanical device.

The resultant "servo-soldier" would be able to lift heavy pieces of equipment beyond the strength of a dozen men. If the concept proved workable, the "servo-soldier" would have a significant impact on handling heavy military items, such as air-dropped cargo, missile components, and unitized supplies.

The proposal was submitted to the Army by the Cornell Aeronautical Laboratory, which suggested a feasibility study to determine whether construction of such a device is possible.

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tecting and helping to build our Nation."

Every proposal for foreign research is carefully studied by ERO or FERO analysts before it is forwarded to the Technical Service(s) having immediate interest in the area of research suggested. Within the Technical Service(s) the proposal is thoroughly analyzed and evaluated on the basis of scientific merit and compatibility, as well as importance, with overall Army requirements and interests.

Provided the proposal receives a high merit rating, it is returned to ERO or FERO for allocation of funds and contractual negotiations. A project officer is assigned to monitor the progress of each contract and to insure that proper distribution is made of periodic reports.

Dissemination of Information

ERO prepares and distributes technical news notes, bulletins, and other information to U.S. Army scientists on such items as the establishment of new scientific institutes, laboratories or other facilities, and changes in capabilities for research in each of the 13 participating nations. Included are announcements of changes and appointments of prominent European professors, evaluations of research centers, lists of prominent authorities in particular scientific disciplines, state-of-the-art reports, and information regarding symposia or scientific meetings which have specific Army interest.

Expansion of the Army research into Latin America may be traced to convictions expounded more than 5 years ago by Lt Gen Arthur G. Trudeau. At that time he was Assistant Chief of Staff for Intelligence. Nearly 3 years later he became Chief of Research and Development and was thus able to follow up on his original recommendation that a dynamic program of support of Latin American science be initiated.

Dr. D. W. Bronk, President, National Academy of Sciences, National Research Council, invited General Trudeau to address a recent meeting of the Committee on Inter-American Scientific Cooperation. Present to hear his views, and to consider a report of a survey team visit to Argentina, Peru, and Uruguay made at his suggestion, were representatives of the President's Science Advisory Committee, Department of State, Defense Science Board, National Science Foundation, Rockefeller Foundation, Organization of American States, and several leading universities.

Trudeau Explains Purpose

In explanation of the Army's interest in expanding foreign research, General Trudeau has stated:

"I believe that the strength of Army research lies in excellence and uniqueness spread over a wide scientific, technological and geographic base. . . . Advances in science and technology will probably increase the Army dependency on foreign sources of information to make sure that no significant discovery or development escapes our early exploitation for purposes of national defense.

"I believe it is essential that the Army continue to develop its own means to insure that our scientists are well provided with the greatest amount possible of the latest information. This understandably selfish primary objective of Army foreign research cannot be completely divorced from the apparent fact that science and technology are increasingly an instrument of national and international policy.

"Our program, tailormade to provide us unique advantages and benefits, is capable of a sizable contribution to our international objectives since it is also tailormade to benefit the foreign scientists; that is, the research supported is always unclassified, publication of results in scientific journals is encouraged, and the financial support permits research that might otherwise not have been done. . . ."

Field Radio Relay Given Longer Range Capability By Parametric Amplifier

Increased amplification will soon give the Army's AN/GRP–66 field radio-relay system long-range over-the-horizon communications capability.

An International Telephone & Telegraph (ITT) Corp. recent announcement said that minor modifications to the basic set, engineered under contract with the Army Signal Research and Development Laboratory, Fort Monmouth, N.J., achieve greatly extended range coverage.

Addition of a power amplifier and use of a parametric amplifier in the receiver unit enable the unit to transmit signals far beyond the horizon by bouncing them off the atmosphere's tropospheric layer. The parametric amplifier reduces effective receiver noise and thus extends range coverage without costly increase in transmitter power.

Consisting of five basic units, the set provides multichannel telephone service, handles signals for operating teleprinters, facsimile machines, combat radar and television systems, and performs other functions in the forward area. ITT said the set controls up to 96 voice channels simultaneously, is operable and maintainable by nontechnical personnel and is capable of round-the-clock service over long periods of time under all climatic conditions, from Arctic cold to tropical heat and humidity. Advanced engineering techniques, including use of transistors, reduced the number of tubes from 138 to 41.

The AN/GRP–66 is assembled in a small shelter-package that can be truck or helicopter transported to meet fast-changing tactical situations.

Engineers Foal 1-lb. Horse By Use of Stainless Steel

Stainless steel has enabled designers of internal combustion engines for automotive use to reach a long-elusive goal: the breeding of a 1 pound horse—that is, a practical engine that would generate 1 horsepower for every pound of its own weight.

Steelways, official publication of the American Iron and Steel Institute, reports that a California engineering company has unveiled a 175-pound engine which generates 175 hp. The secret of this 4-cylinder marvel is an engine block assembly made of thin stainless steel sheet. This stainless steel block not only contributes to the engine's lightness, durability and high power, according to *Steelways*, but eliminates corrosion problems in water-cooled units.

Engineers Study Underwater Explosion Effects Related to Coastal Defense

Studies to determine the generation of water waves from explosions on or beneath the water surface and to determine the effects of explosions in shallow and deep water are in progress along the banks of the Big Black River near Vicksburg, Miss.

The nuclear-like explosions, which send columns of water, muck, and smoke mushrooming into the air, much like atomic bomb explosions, used to keep folks in the neighborhood of the 10-acre test site nervous and jumpy. But the nervousness has now disappeared, because the blasts have been going on almost 10 years.

The explosions are part of a U.S. Corps of Engineers' research and development project conducted by the U.S. Army Engineer Waterways Experiment Station at Vicksburg to determine what dangers face American coastal and harbor cities from possible underwater explosions. The tests are designed also to determine the effects of explosions in the earth and air as well as in the water.

TNT Used in All Tests

The investigations are under direct supervision of G. L. Arbuthnot, Chief of the Special Investigations Section of the Hydraulics Division. Mr. Arbuthnot said explosions range in size from the magnitude of that caused by firecrackers to hundreds of pounds of explosives. TNT is used in all the tests.

No nuclear devices are used in the tests, though nuclear explosions are simulated. Mr. Arbuthnot said probable results of nuclear blasts can thus be determined.

"In addition to determining what to expect from underwater explosions in our own harbors," he said, "we can learn from these blasts what we can do to the enemy with underwater nuclear explosions."

3 Generals Assume New Duties

Brig Gen Elmer J. Gibson, has been assigned to the U.S. Army Ordnance Weapons Command, Rock Island Arsenal, Ill. He was formerly Assistant Chief of Staff, G–4 (Logistics), Eighth U.S. Army, Korea.

Brig Gen Oren E. Hurlbut, Commanding General, U.S. Army Ordnance Weapons Command, Rock Island Arsenal, has been assigned to Eighth U.S. Army, Korea.

Brig Gen James B. Lampert, formerly Deputy Chief for Logistics and Administration, Military Assistance Advisory Group, Vietnam, was recently assigned to the Office, Chief of Army Engineers, Washington, D.C.

Secretaries pose before sign indicating Ordnance Research Office transfer.

Huachucan Devises "Probability" Estimator

A mathematical model that can provide the Army with "probability estimates" in many phases of the scientific field has been devised by George Reynolds, an employee in the meteorological department of the Army Electronic Proving Ground at Fort Huachuca, Ariz.

Mr. Reynolds completed his project during a 6-month "leave of absence" from his normal duties granted under the Commanding General's Resident Fellowship Program. He was the first employee at the Proving Ground to take advantage of this "concept in promoting independent scientific research" developed by a committee of Proving Ground scientists.

Has Proved Successful

Described as a "mathematical model designed to estimate the odds that a selected condition or event will or will not take place," the product has already proved successful in the examination of an assortment of geophysical, engineering, biological and sociological data, according to Mr. Reynolds.

Data provided by the model can be fed into computer equipment which produces an answer to questions within minutes, Mr. Reynolds said.

Besides his 6-month resident work, Mr. Reynolds spent his off-duty time during the past 5 years working on the project.

New First Aid Kit Adapted To Advances in Weaponry

A newly developed first aid kit that reflects advances in modern weaponry will help the soldier to help himself and his fellow fighting man in the future.

The kit is designed to cope with increased casualty rates and with mass casualty situations where treatment by medical service personnel may be unavoidably delayed. Developed at the Army Medical Equiment Development Laboratory, Ft. Totten, N.Y., the waterproof, weatherproof kit is being user tested by the three military services.

Balancing the need for more medical items against weight and size considerations, the kit measures 8 x 2 x 4 inches, weighs about a pound, and will attach to a standard pistol belt. It contains two inner packets, one to be used by the individual himself, the other to be used on a fellow soldier in a mass casualty situation. An injured person can open them quickly and easily even when wearing gloves.

Turbine-Powered Helicopter

Kaiser Fleetwings Inc., Bristol, Pa., and Doman Helicopters Inc., Danbury, Conn., have joined in an agreement to submit a proposal for a 4-place, high performance, turbine-powered helicopter for the Army. The joint proposal is based on design work by Doman under an Army contract for studies on operational requirements for an "ideal light observation helicopter." Kaiser Fleetwings is an affiliate of Kaiser Industries Corp.

Newsmagazine Depends on Contributions of Material

Favorable comments received from many elements of the widely dispersed Army R&D program are gratifying to the editors of the *Army Research and Development Newsmagazine*, cognizant as they are that the introductory issues point up the need for contemplated improvements.

If the *Newsmagazine* is to progress steadily toward its goal of reflecting the broad scope and diversification of Army R&D activities, it must receive the unstinting support of all those who are in position to supply the type of information most valuable or interesting to our readers.

Truthfully, it may be stated that the *Newsmagazine* can establish and maintain high standards of readability only through contributions of suitable material. A few polishing touches may be credited to the editors, but the raw material—the diamonds in the rough—must come from our readers and their local technical liaison or public information offices.

As stated in the first issue, the *Newsmagazine* staff consists presently of two men. We have no reporters to send out in the field nor do we have photographers and artists to provide the illustrations to make the publication sparkle.

Consequently, the policy of the editors is to encourage submission of by-line articles adequately supported by photographs, illustrations, line drawings, or other artwork to enhance appeal to readers. Authors' names will be publicized through proper credits. Likewise, cartoonists may place their names or initials on their work.

The purpose of the *Newsmagazine* is explained in the masthead statement on page 2, column 1. To serve this purpose effectively, a wide variety of news items and feature articles by scientists, engineers, and administrators particularly qualified in their subject fields must be submitted.

All significant aspects of R&D are of interest, whether reported in the planning, research or development stage. People are interested in the *Newsmagazine* only as it conveys to them information of value, whether that information relates to progress, to matters involving their morale and welfare, to line-of-duty humorous or human interest happenings, to community relations activities, to the successes of individuals (awards, promotions, reassignments), and to the particular or overall capabilities of in-house installations.

No compensation can be paid for any material submitted for publication in the *Newsmagazine*. It is hoped that annual awards may be established to give deserved recognition for the best feature articles and other categories of material, and this possibility is being explored.

To insure policy conformance, security and accuracy, material intended for publication should be submitted through normal command channels to the Research Support Division, Army Research Office, Office of the Chief of Research and Development.

Frankford Physicist Helps On Argentine X-Ray Project

Ralph Feder, physicist with the Pitman-Dunn Laboratories at Frankford Arsenal, Philadelphia, is spending 5 months in Argentina to assist Dr. Jorge Sabato, head of the Metallurgy Division of the Argentine Atomic Energy Commission in setting up an X-ray diffraction laboratory and in organizing personnel to work on other problems for the AAEC. The work is being carried out principally at the Institute of Physics, Bariloche, Argentina.

Mr. Feder's work came to the attention of Argentine scientists while he was at the University of Birmingham, England, on a Secretary of the Army Fellowship. His work in the university's Department of Physical Metallurgy under Dr. Robert W. Cahn, plus the recommendation of Dr. Cahn during his visit to Argentina, resulted in the invitation to Mr. Feder to visit Argentina to assist the AAEC.

ERDL Building Vehicle For Generator Studies

Army engineers will be able to study the design problems associated with high-speed rotating equipment, high frequency generation, and static-frequency conversion by means of a research vehicle under construction by the U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va.

The vehicle is a 70-kw, 120/208–240/516 volt, 3-phase unit, which the Laboratories are constructing under the sponsorship of the U.S. Army Research Office.

The vehicle will consist of a high-speed induction alternator operating at speeds of approximately 40,000 r.p.m., and a static frequency converter, which will change the generator output frequency of 3,200 cycles to either 400 cycles or 60 cycles. The lightweight alternator will enable the Army to take full advantage of the lightweight characteristics of gas turbine engines. It eliminates the need for reduction gears on the turbine engines, as the generator will be coupled directly to the engine and will operate at engine speed. Estimated weight of the system is 275 pounds.

Army military and civilian research chiefs confer at Army Research Office-Durham, N.C., on Army-wide physical sciences responsibilities recently assigned to former Ordnance Research Office. Left to right, seated, are: Dr. John W. Dawson, Chief Scientist, ARO-D; Col George W. Taylor, Commanding Officer, ARO-D; Maj Gen William J. Ely, Director of Army Research, Office of the Chief, Research and Development (OCRD); Dr. Richard Weiss, Deputy and Scientific Director of the Army Research Office; standing, Dr. O. R. Herschner, Jr., Chief, and Deputy Chief Lt Col L. R. Anderson, Physical Sciences Division, Army Research Office, Washington, D.C.

TRECOM Honors Model Shop Employees

Col John D. Crowley, Jr., Commanding Officer of USATRECOM, Fort Eustis, Va., presents Certificate of Achievement to Aldo Chiesa, model shop foreman.

The men who translate a blueprint into a working model of what was in a designer's brain are frequently overlooked when laurels are passed around for the successful outcome of a research and development project.

The U.S. Transportation Research Command at Fort Eustis, Va., however, showed its appreciation for the work of these skilled craftsmen by awarding to employees of its model shop certificates of achievement for completing in record time a full scale wind tunnel model of a helicopter.

In part, the certificates of achievement read: "The data to be obtained from this model will produce timely information for the Army's highly significant and important development of the new light observation helicopters. The model shop's contributions have enabled this command to effectively pursue its portion of the joint program with the National Aeronautics and Space agency."

Col John D. Crowley, Jr., commanding officer of USATRECOM, presented the certificates.

Joint Effort Aimed At GEM Progress

(Continued from page 1)

by representatives of the Transportation Corps and Marine Corps.

Following the design and analysis competition, the two services hope to have completed by fiscal year 1962 an exploratory research GEM for actual testing of the capability of such a vehicle. Both services have included in their fiscal year 1962 budgets provisions for building experimental GEMs, one for each service, with effective diameters of 60 feet, 15-ton payloads and 30-ton gross weight apiece.

Production Planned in 1965

Successful capability tests of the research vehicles would be followed in fiscal years 1963–64 by a development program, the services hope, which in turn could lead to large-scale production in fiscal year 1965.

In asking for design study proposals, spokesmen of the Army and Marine Corps told the industry representatives that the desired GEM should have amphibian capability, with a speed somewhere between 25 and 100 knots, stable control, and ability to cruise at a height of 2 feet above surface and hover at a 3-foot height.

Expressing optimism concerning faster progress in making GEMs available for military use, Lt Col Frank G. Hubbard, Chief of the Transportation Corps' Research Division, said: "The Kitty Hawk era is over, and we believe that the time has come for the development phase to commence."

Fort Meade Planning $1,250,000 Medical Lab Construction in Spring

Groundbreaking for a new $1,250,000 building to house the Second Army Medical Laboratory, Fort Meade, Md., is scheduled for spring.

To mark the 13th, and possibly last, anniversary in the old building, Laboratory personnel held open house Jan. 25 that included technical demonstrations for the military and civilians. Each of the laboratory's eight divisions—immunology, virology, bacteriology, parasitology, veterinary, biochemistry, pathology, and entomology—featured exhibits of their particular operations and functions.

The Pathology Division demonstrated the technique of screening tissue for cancer cells by fluorescent microscopy. With this method, images are seen as white on black rather than the more common black on white.

The Bacteriology Division, which deals with testing for the bacteriological purity of drinking water, processing and identifying of virulent tuberculosis organisms and identification of epidemic strains of staphylococci, exhibited cultural characteristics and kodachrome slide projections of disease-producing fungi.

The Entomology Division, which carries on studies of insects and maintains displays of insects, primarily mosquitoes common to the Second Army area, showed a color film on insects from the beginning of time to the present. The division's most recent addition to its facilities, an insectory where mosquitoes and flies are propagated, was open to visitors.

The Immunology Division demonstrated several serological techniques for showing the presence of various disease antibodies and the Virology Division demonstrated methods of isolating and identifying viral diseases.

The Veterinary Division, which performs chemical and bacteriological tests on all animal-origin food procurement items produced or used in the Second Army area, exhibited its animal house where guinea pigs, rabbits, rats, and mice are raised for experimental purposes.

The Laboratory is charged with a number of other responsibilities. These include investigations into outbreaks of disease and conditions which may or do affect the health of military personnel and animals. The Laboratory conducts medically significant research on insects and rodents; evaluates laboratories of hospitals and dispensaries within the Second Army area; trains laboratory personnel; and coordinates with Federal, State, county, city and other governmental laboratories and civilian medical institutions within the area to keep abreast of trends in laboratory methods and equipment, and to become aware of any unusual disease or incidence.

Gas Turbine Powered Army Aircraft Fleet Foreseen Within 10 Years

By Captain Joseph J. Muter — *U.S. Army Transportation Corps*

Feasibility of a change to gas turbine engines to power the Army's entire aircraft fleet within 10 years is indicated by current research.

In the early 1950's, the Army sponsored development of a shaft turbine engine. Through the years continued research has led to a group of turbine engines now scheduled to power the majority of aircraft being developed by the Army.

Original reasons for developing this type engine for new aircraft were: (1) that reciprocating engines were maturing and further improvements were difficult to realize; (2) gas turbine engines in turbojet form had proved a highly efficient, lightweight, reliable source of power; and (3) primary emphasis at the time was on high thrust or horsepower machines, leaving a void in the horsepower ranges in which the Army had primary interest.

Considering limitations on Army aircraft, and aircraft usage philosophy, low and slow, engine development was directed toward the lower horsepower category and to a form more suitable to Army requirements. This was accomplished by converting the high energy jet thrust to shaft horsepower by means of a power turbine wheel. Required horsepower could then be drawn from the end of a shaft to drive a propeller (turboprop) or helicopter transmission (turboshaft) to fit Army type aircraft.

Potential advantages were manifold. It became possible to develop 2 horsepower per pound of weight versus 1 horsepower per 2 pounds of weight in reciprocating engines. Aircraft could be designed smaller to perform the same mission or to provide greater payloads for a given size aircraft. This same horsepower to weight advantage allowed exploitation of the VTOL (Vertical Takeoff and Landing) field by the Army where weight was a critical factor.

Other potential advantages included longer service life, greater reliability, elimination of clutches for helicopters and lighter transmissions since they did not have to withstand the pulsating type power output common to reciprocating engines. These and other reasons provided sufficient incentive to proceed with a development program. Basic considerations in design, which to date have not changed, were simplicity, reliability, maintainability, and performance.

The Army, to a great extent, has taken the lead in development of gas turbine engines in the lower horsepower field. Starting with the T–53–L–1 turboshaft, currently rated at 860 shaft horsepower (SHP), a family of engines has been evolved to include the T–53–L–3 turboprop at 960 SHP and the T–53–L–5 turboshaft helicopter engine also at 960 SHP. A prime consideration in these latter developments is interchangeability of parts to reduce the logistical support problem. Except for necessary differences in reduction gearing and fuel control, this goal has been achieved in the T–53–L–3 and L–5.

Growth versions of the L–3 and L–5 currently under development are the T–53–L–7 turboprop and T–53–L–9 turboshaft. These engines will be rated at 1,100 SHP and maintain the concept of parts interchangeability. We also hope to reach the 1,100 SHP rating by increasing turbine temperature, thereby allowing re-rating of all previously delivered T–53–L–3 and L–5 engines to the higher rating by adjustments to the fuel control alone.

The engine numbering system is devised as follows:

T—Turboshaft or Turboprop;

53—AF approved model number (Navy uses even numbers);

L—Lycoming (manufacturer);

7—Engine version (AF -odd, Navy -even).

Another series of engines developed for the Army by Lycoming is the T–55. The T–55–L–1 is a turboprop engine rated at 1,600 SHP, T–55–L–3 a turboshaft engine rated at 1,850 SHP and the T–55–L–5, presently being developed for the HC–1 Chinook, rated at 2,200 SHP. The only version slated for production is the L–5, which has no reduction gearing in the engine and has an integral oil tank and cooler, thereby allowing reduction in helicopter empty weight.

The latest engine development initiated by the Army is the T–63 rated at 250 SHP and currently in the early stages of development at Allison Division of General Motors. This engine is intended to replace reciprocating engines in the same horsepower category for future applications. It is a strong contender for use in the light observation aircraft presently being evaluated by competitive bid.

As can be seen by the foregoing, the development of gas turbine aircraft engines in the 250 to 2,200 horsepower spectrum has been covered primarily by the Army. Several engine manufacturers are developing a 500 SHP turbine engine commercially, so Army requirements for this size may be available on an off-the-shelf basis without expenditure of R&D dollars.

Recent airline experience has shown that the failure rate of the best turbine engines is once per 12,000–15,000 hours versus the best reciprocating engine rate of once per 3,500–4,000 hours of operation, thereby indicating that the reliability goal is readily achievable in our developments.

Future Army plans in gas turbine engines encompass primarily the improvement of engines currently in inventory or under development rather than initiating any new engine programs, unless there are some major breakthroughs or specific requirements are generated. Areas of improvement will be the increase of overhaul life from 150 to 1,000 hours, improved specific fuel consumption, better acceleration rates than the 5 seconds from flight idle to full power being achieved now, and lower unit cost than the $50,000 per copy being paid now for the T–53.

Flanking Col. John D. Crowley, Commanding Officer of the U.S. Army Transportation Research Command, Fort Eustis, Va., are former Deputy Commanders Col. Theodore L. Poole, Jr., left, new Commanding Officer of the U.S. Army Transportation Combat Development Group, and Col. Robert B. Harrison, Commanding Officer of newly Reorganized U.S. TRECOM Board.

Signal Corps Center Records All Satellite Orbits

Since the successful firing of Sputnik I launched the satellite age on October 4, 1957, the Astro-Observation Center of the U.S. Signal Research and Development Laboratory at Fort Monmouth, N.J., has received the signals of all known space vehicles.

The Center had monitored and compiled a library of recordings of approximately 20,000 orbits of all types of satellites as of the first of this month. Sputnik I's signal was picked up a few hours after launching was announced.

While the Center is designed primarily to provide data for the study of wave propagation as associated with radio transmissions from outer space, its receptions and records have proved valuable in other fields. Its accurate doppler recordings are widely used in determining the orbits of both U.S. and foreign satellites, and have been instrumental in the immediate evaluation of the success or failure of satellite launchings from Cape Canaveral, Fla.

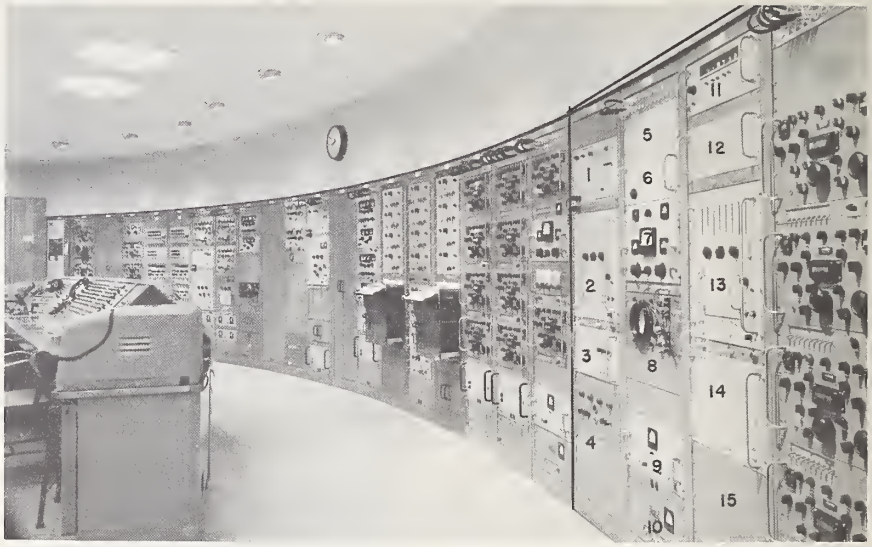
The Astro-Observation Center consists of two stations, one a 208-acre facility near Deal, N.J., known as the Deal site, and the other located on Shark River near Belmar, N.J., popularly called the Diana site, because it is the location of the Diana facility which first bounced radar signals off the moon early in 1946.

The Deal site, in operation 24 hours a day, monitors all satellite transmissions. Equipped to blanket the frequency range from 15 kilocycles to 900 megacycles, it can move into the kilomegacycle range for specific vehicles. Its complete receiving, recording, and measuring equipment is fed signals from an array of antennas including horizontal and vertical polarized yagis, circular polarized yagis and broad band conical helices with right- and left-hand polarization.

Data received and processed at Deal are recorded in a number of ways. Digital readout of doppler is recorded in printed form on a 3-inch paper tape and also on perforated teletypewriter tape. The latter can be fed into a standard teletypewriter tape reader for immediate transmission over wire line circuits.

Signal level measurements are recorded on eight channel Sanborn recorders, and telemetry data on both Sanborn and magnetic tap recorders. All records are keyed and coded for identification, and indexed so that doppler, signal level, and telemetry records can be grouped together for study.

Located at the Deal site is a newly constructed ground facility designed for the Courier communications satellite. Built as a separate entity, the Courier equipment consists of a 28-foot paraboloidal antenna, tower mounted, and vans housing receiving, transmitting, and command equipment.



Electronic gear at U.S. Army Signal R&D Lab Astro Observation Center.

The Diana station is a basic research facility for the study of wave propagation, communications, and radio astronomy. Here two huge paraboloidal antennas, 50 and 60 feet in diameter, rear above the surrounding trees and operational buildings.

In satellite activity, the station has been exceptionally useful as the prime receiving and control center for the highly successful Tiros weather observation space vehicle launched last fall.

The 60-foot dish was used for Tiros. It also was employed with marked success in reception of signals from the Russian Lunik II shot and the Pioneer space probes.

The 50-foot antenna, long used for moon-bounce experiementations, transmitted 108-megacycle signals via the moon to the Western Hemisphere's Minitrack stations to achieve accurate calibration.

The two stations, Diana and Deal, are integrated through the use of a microwave link.

Stahr Sends Message of Greeting to Army

On assuming office as new Secretary of the Army, Elvis J. Stahr, jr., issued the following greeting to all Army commands and agencies:

"Deeply conscious of the gravity of the obligations which I have assumed as Secretary of the Army, I greet all its members worldwide, both military and civilian, in humbleness of spirit, but with high confidence that together we shall go forward to achieve the goals to which the Army is committed by the nature and urgency of its mission. I shall ever exert my best efforts on behalf of the United States Army as a primary element of our national defense, and in turn I shall count upon the full support of the Army in carrying out to the best of my ability the duties and responsibilities of my office."

A former Assistant Secretary of the Army, Secretary Stahr is a lawyer and educator. After graduation from the University of Kentucky, he attended Oxford University as a Rhodes Scholar. In 1947 he became an associate professor of law at the University of Kentucky and in 1948, dean of the University's school of law. Until his appointment as Secretary, he had served as President of the University of West Virginia since 1959.

Secretary Stahr practiced law in New York for 8 years and subsequently was an infantry officer for more than 4 years in World War II. He served overseas for more than 2 years, was in combat in China many months and rose in rank from second lieutenant to lieutenant colonel. His decorations include the Bronze Star, with oak leaf cluster.

In making way for Secretary Stahr, former Secretary Wilber M. Brucker addressed a farewell message to all personnel of the U.S. Army in which he expressed deep appreciation and "gratitude to all of you for the splendid support you have given me . . . I shall continue to do everything I can for the Army throughout the rest of my life."

Farm Expert Now Budgets ABMA's Missile Harvest

From master maize grower to multi-million-dollar manager of Army R&D money is the span of Mr. James I. Spaugh's career.

Two decades ago Mr. Spaugh was a champion corn grower in Indiana. Today, as Chief of the Financial Management Office at the Army Ballistic Missile Agency at Redstone Arsenal, Huntsville, Ala., he controls the spending of upwards of $500 million a year.

World War II interrupted Mr. Spaugh's farming when he joined the U.S. Government service at Pearl Harbor, Hawaii. As chief of planning for the Naval Air Station, he worked with a group that supported all aircraft operating from carriers in the South Pacific.

After Hawaii, Mr. Spaugh served the Government in the Panama Canal Zone and, later, at Camp Atterbury, Ind. Here he resumed his interest in farming, working with his father who is widely recognized in Indiana as an authority on agronomy and horticulture. He judged grains, vegetables, and fruit at county fairs and, at one time, had under propagation 10,000 gladiola bulbs.

Since coming to Huntsville, Mr. Spaugh has found time to dabble a bit with earthbound growths: 100 African violets he is propagating in his back room "farm" and a flower garden containing various hybrids and transplants. But his consuming interest, even as he putters with his flowers, is something not intended to be earthbound—missiles.

Even here, the one-time corn grower has use for his farmer's philosophy. A comptroller, he explained, must possess wide knowledge of purchasing, parts and components, engineering costs, and production techniques.

Like a farmer, however, he also has to take into account possible "crop failures" in the missile business and "inclement weather" in development programs. He has learned, too, that a small amount of money can often spray bugs off a sizable problem.

In brief, Mr. Spaugh has forsaken tilling the soil, but he is still keenly interested in another kind of till—the money till, that is.

QM Tests Missile Tent

The Quartermaster Equipment and Parts Center at Columbus, Ohio, General Depot recently tested a NIKE-HERCULES missile tent developed by the QM Research and Development Command at Natick, Mass. The air-supported nylon tent, which can be heated, has a triangular, zipper-fastened door near the front. A ripcord enables missilemen to take down the tent within only a few seconds.

QM Climatic Laboratory Studies Clothing Needs

While the citizens of Natick, Mass., bundle themselves up against the bleak New England weather, nearby in a building measuring 232 by 190 feet men are sweating out the heat and humidity of a steaming jungle.

Come next summer and the Natickites will stroll their streets in shirtsleeves or lightweight clothing. Then the men in the building may be experiencing the bitter cold and wind of arctic barrens.

The building houses the Climatic Research Laboratory of Headquarters Quartermaster Research & Engineering Command, U.S. Army Quartermaster R&E Center at Natick. In it the QM Corps obtains the facts and develops through planned research the principles it requires to fulfill its responsibility of protecting the combat soldier from cold, heat, and all other unfriendly weather conditions.

The climatic chambers in the Climatic Research Laboratory are designed to study worldwide environmental conditions and their effects on the combat soldier. Climatic factors important to combat personnel—whether soldiers, sailors, or airmen—regardless of the region or season of the year, are wind, humidity, air temperature, solar radiation, longwave radiation (heat gained from or lost to sky and surrounding objects), and moisture, such as rain, sleet, snow, ice.

Specialized tests and studies in these fields of research are conducted by the research and development divisions of the Command in the Climatic Research Building. Unusual among similar research installations in this country because of its functional versatility, this building contains two climatic chambers—arctic and tropic, both subject to controllable wind.

In these chambers it is possible to study men and their equipment under conditions similar to those found in arid deserts, jungles, cold-dry arctic regions, and tricky cold-wet areas, such as Korea.

Each chamber measures 60 by 11 by 15 feet and can accommodate up to 25 soldier test subjects at a time. The arctic chamber can produce a temperature range of 70 degrees Fahrenheit down to minus 70 degrees; the tropic chamber's temperature range is between zero and 165 degrees. Two fans 13 feet in diameter supply winds up to 40 miles per hour.

A rainfall court measuring 15 by 20 feet can produce downpours up to 3 inches per hour. Snowfalls of any reasonable level may be maintained. The bivouac area is fitted with eyelets in the floor so that tents can be pitched and men and equipment can be exposed to various weather conditions for any required period of time.

Use of the climatic chambers makes it possible to gather from a few men in a short time data that can be used as a guide for the design and use of clothing and equipment. For example, a 1-week study of continuous wear of the insulated boot gave results which warranted issuance of the boot for winter combat wear in Korea.

As a consequence, frostbite casualties were reduced to the vanishing point. If it had been necessary to wait for field tests and combat experience, wide use of the boot would have been delayed for a year or more, and many foot casualties would undoubtedly have resulted.

With bodies wired to record skin temperatures, participants in tests of experimental hot-dry (desert) uniforms, relax in tropic wind climatic chamber.

I wish to thank you for including me on the distribution list for your new publication *Army Research and Development Newsmagazine.* It is an excellent, well written and informative booklet and the publishers should be proud of their efforts. I have circulated my copy to many who have had no direct connection with research and development, with the same resulting opinion.

EMIL A. LUCKE
Colonel, GS
Advisor, U.S. Army Advisor Group
Alameda, Calif.

This letter is not intended to detract from the accomplishment of North American Aviation in its development of the lightweight ejection seat for VTOL aircraft. In the interests of accuracy and proper credit to dedicated engineers, however, two errors in the article "VTOL Escape Seat" on page 22 of the December issue of *Newsmagazine* should be corrected.

STATED: Previous ejection seats were not effective at low altitudes.

FACT: All seats powered by the XM8, 9, 10 and 12 Rocket Catapults (predecessors to the XM13 used on the NAA seat) will eject the seat to a height adequate for safe parachute deployment while the aircraft is traveling "on the deck." In sled tests, the XM10 has ejected a 410-lb. mass to a height of 100 feet with the speed being Mach 0.9. The other units mentioned have comparable performance characteristics. The XM10 has been installed in operational F104 aircraft since September 1958.

STATED: The "ejector" is a product of North American Aviation.

Fact: The XM13 Catapult was developed by U.S. Army Ordnance, Frankford Arsenal for the Transportation Corps Research and Engineering Command for installation in the North American Aviation VTOL aircraft seat. All of the devices mentioned above are developments of Frankford Arsenal and are based on the technology developed by the Naval Ordnance Test Station, China Lake, California, in its RAPEC program.

Inter-service cooperation marks the development of Propellant Actuated Devices (PAD) for aircrew escape systems. Frankford Arsenal is considered by the Air Force to be the principle development source of PAD for flight vehicle application. Nearly 200 different PAD have been developed for the Wright Air Development Division to date, and all U.S. combat aircraft operational today includes Arsenal PAD in their escape systems.

W. H. SIMMONS
U.S. Army Ordnance
Frankford Arsenal
Philadelphia

AFEB Marks 20 Years of Medical Service

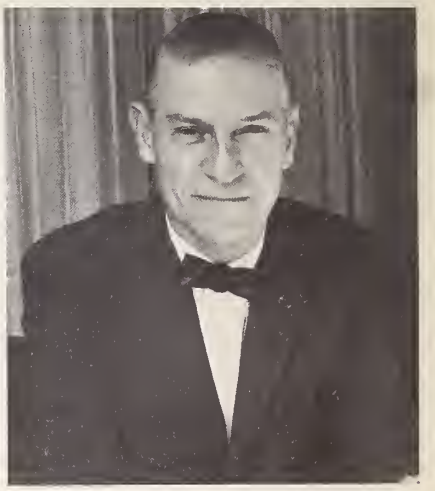
The Armed Forces Epidemiological Board (AFEB), which provides advice to The Surgeons General concerning research in infectious diseases and military personnel injuries, recently marked its 20th anniversary.

Composed of top civilian medical scientists, the Board was established in 1941 to advise the Army and later the other military medical services on preventive medicine problems of military importance.

The group advises upon field investigations conducted by its members in connection with studies on the prevention of epidemic diseases. An outstanding example has been influenza studies, which were stimulated by the World War I experience when 20 million deaths from influenza and pneumonia occurred throughout the world.

In peacetime the AFEB functions as more than an advisory group. Research conducted under its guidance and financially supported largely by the Army Medical Research and Development Command aims at preventing future losses of military manpower from disease and injury.

Investigations by members of the Board and its 12 commissions have established the effectiveness of penicillin in preventing streptococcal infections and rheumatic fever, have demonstrated the effectiveness of a group of therapeutic agents now widely accepted for the treatment of typhoid fever and rickettsial diseases, and have evolved various improved products and techniques for immunizing troops.



Dr. Gustave J. Dammin, President, Epidemiological Board

Currently, personnel of the Board are participating in a broad field of investigation including studies of penicillin sensitization, staphylococcal food poisoning, the common cold, streptococcal infections, influenza vaccine, growth of viruses, diarrhea, infectious hepatitis and various tropical diseases. An important area of present interest to the Board concerns the effects of radiation on infection and immunity.

By contributing toward the knowledge of epidemiology and preventive medicine and public health in general, the Armed Forces Epidemiological Board assists the military medical services in accomplishing their primary mission of protecting and conserving military manpower.

Ordnance Corps Honors Tawes For Understanding, Support

Lt Gen J. H. Hinrichs, Chief of Ordnance, recently presented to Governor J. Millard Tawes of Maryland an Army Certificate of Appreciation. Governor Tawes was cited for his "understanding, cooperation, and support" of Ordnance Corps activities in Maryland, particularly at the Aberdeen Proving Ground, third largest employer in the State. Presentation of the award highlighted a meeting of senior scientists of the U.S. Army Ordnance Corps held at Easton, Md.

Ordnance Corps To Obligate About $3 Billion in FY '61

The Army Ordnance Corps will be responsible for obligating approximately $3 billion dollars during fiscal year 1961, according to the Corps' year-end report. This money will be used for research and development, procurement and production, training, maintenance, supply, and other support activities.

The report also notes that the Corps is the largest of the Army Technical Services in terms of personnel, budget and active installations. Eighty-one active Ordnance Corps installations occupy 1,600,000 U.S. acres or an area larger than the State of Delaware, crisscrossed by 12,400 miles of roads, equal to the entire road network of New Hampshire.

The Corps' laboratories, warehouses, offices, shops, schools, depots, and arsenal structures utilize 160 million square feet of floor space—equal to over 100 Pentagons, and material in storage occupies 400,000 acres, or approximately half the area of Rhode Island.

Military Technology Contributes to Scout's Success, Representative of NASA, U.S. Army, Navy Cooperation

Military missile technology contributed to the National Aeronautics and Space Administration's February 17 placing of a satellite in orbit for the first time with a solid-fueled booster.

NASA succeeded on its second test of the four-stage Scout space booster in placing a 12-foot-diameter inflatable sphere into orbit though failure of the satellite's radio beacon hampered tracking efforts.

Called the "poor man's rocket" because each costs only $750,000, the Scout can place 150 pounds into a 300-mile orbit, and will be used extensively by NASA and the military services for scientific space research.

Scout's second stage, the 62,000-pound thrust Castor developed by the Thiokol Corp., is a modification of an engine developed for the Army's Sergeant missile.

The 103,000-pound thrust first stage engine, Algol, developed by the Aerojet General Corp., was modified from an early engine used in the development of the Navy's Polaris missile. The third (Antares, 13,600 pounds thrust) and fourth (Altare, 2,800 pounds thrust) stages, were developed by the Hercules Powder Co. They are modifications of an engine scheduled for the Vanguard space booster originally developed by the Navy.

Participating in the 12-foot-balloon experiment, which is intended to reveal the effect of drag on a space vehicle, is the Astro-Observation Center of Fort Monmouth's U.S. Army Signal Research and Development Laboratory.

Engineers Testing Tractor Using Gas Turbine Power

A gas turbine powered tractor—one of the first military applications of turbine powered earthmoving and construction equipment—is undergoing tests at the U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va.

The tractor, which will serve as a testbed for evaluating the gas turbine, is a standard rubber-tired Caterpillar Model DW–15 repowered by a GMT–305 gas turbine engine.

The new engine weighs approximately 600 pounds compared with approximately 5,000 pounds for the tractor's original diesel engine. The large weight differential, however, is offset to some extent by the weight of adapting gearboxes.

The original diesel engine has a maximum 200 hp. rating, while the gas turbine has a maximum 206 hp. rating.

LCM-8 Tested for Crash Landing off Cargo Ship

To determine feasibility of launching LCM–8s (landing craft, medium) from a cargo ship, the U.S. Transportation Research Command is conducting a series of experiment. This 20-foot drop from a pier did not damage LCM-8.

Photography Plays Role In Army Missilry R&D

Photography as a function of missilry research and development is carried out by the Pictorial Division of Army Signal Missile Support Agency at White Sands Missile Range, N. Mex.

Part of the Signal Corps' worldwide photographic operations, the Pictorial Division's laboratory at White Sands is one of the Nation's most unusual and is Signal's only photo laboratory that specializes in missile photography.

The Pictorial Division provides information for engineers, technicians, and scientists on missile performance during research and development tests. In addition, it performs photographic missions in other fields, provides information in the form of still and motion pictures of the Army's progress in the missile field, and produces complete motion picture films for worldwide distribution.

Maj Robert F. Tacey is chief of the Pictorial Division. Under him is a staff of 80—military and civilians—divided into five branches: motion picture, still picture, service, photographic engineering; and scenario writing.

DOFL Scientist Awarded Presidential Citation

Mr. Wilbur S. Hinman, Jr., Director of the Diamond Ordnance Fuze Laboratories, recently received the President's Award for Distinguished Federal Civilian Service, the Nation's highest award for civil service employees.

The citation accompanying the award said: "An acknowledged pioneer in the application of electronics to military weapons, he has by his outstanding ingenuity and inventiveness, made technical contributions having worldwide impact.

"Through his brilliant leadership of scientists and engineers in the creation of new electronic techniques and devices having both military and civilian uses, he has enhanced the safety, security, and well-being of the Nation and of the free world."

Incentive Awards Emphasized

Under the Incentive Awards Program at Frankford Arsenal, Philadelphia, 96 employees shared $12,055 in cash awards for sustained superior performance and new ideas adopted for the month of November 1960. The largest award was $500, made to Harry G. Penn, Chief of the Small Arms Ammunition Manufacturing Branch, for improvements in the design of ammunition for modern ordnance weapons.

New Cabinet members and U.S. Representative to the United Nations take oath of office administered by Chief Justice Earl Warren in White House ceremony attended by President and Mrs. John F. Kennedy. Left to right: Secretary of State Dean Rusk, Secretary of the Treasury Douglas Dillon, Secretary of Defense Robert S. McNamara, Attorney General Robert F. Kennedy, Postmaster General J. Edward Day, Secretary of the Interior Stewart Lee Udall, U.S. Representative to the United Nations Adlai E. Stevenson, Secretary of Agriculture Orville L. Freeman, Secretary of Commerce Luther H. Hodges, Secretary of Labor Arthur J. Goldberg and Secretary of Health, Education, and Welfare Abraham Ribicoff. (The *Newsmagazine* suggests this picture be held as a source of reference for identity of the Cabinet.)

Trudeau Pins New Star On Army Research Head

Director of Army Research William J. Ely was nominated for promotion to major general by President Kennedy Feb. 4 and Lt. Gen. Arthur G. Trudeau, Chief of Research and Development, pinned the symbol of his new rank on him in a ceremony at the Pentagon Feb. 24.

Major General Ely was graduated from the U.S. Military Academy as a second lieutenant, Corps of Engineers, class of 1933. He has had permanent duty stations at Memphis, Tenn., Ithaca, N.Y. (where he attended Cornell University), Fort Belvoir, Va., Midway Island, Honolulu, Hawaii, and Fort Ord, Calif.

In 1943 he was assigned to Headquarters, Sixth Army, and served with its Engineer Section throughout the war, seeing duty in Australia, New Guinea, the Philippine Islands, and Japan.

After serving in the Office of the Chief of Engineers, General Ely was assigned to the faculty of the Armed Forces Staff College in Norfolk, Va., as an instructor in the Logistics Division in September 1948. He was reassigned to the Joint Logistics Plans Group, Joint Chiefs of Staff, in July 1949, serving there until October 1951.

Next came a 2-year tour as Chief, Military Construction, Office of the Chief of Engineers in Washington, D.C., and a 3-year tour as District Engineer of the Corps of Engineers in Sacramento, Calif. In 1956 he was assigned as Deputy Director, Logistics, Headquarters, U.S. European Command and in March 1959, became Director of Army Research.

General Ely holds a master of science degree in civil engineering from Cornell University. His decorations include the Legion of Merit with one Oak Leaf Cluster, the Silver Star, and the Bronze Star.

Chief of Research and Development Lt. Gen. Arthur G. Trudeau pins second star on William J. Ely, Director of Army Research, signifying major general rank.